– a version relationship between successive designs, a derivative relationship between designs, and an alternative relationship between designs.

NOTES

2 – The version, derivative and alternative association can be between either actual or intended objects. These associations are more commonly used between intended objects (i.e. designs).

3 – This UoF is used in conjunction with a UoF containing objects that have variants, derivatives or alternatives.

This UoF can be used in conjunction with the plant_item UoF (see 4.1.15) containing a plant item derived from a reference or catalogue item.

This UoF can be used in conjunction with the catalogue_of_standard_items UoF (see 4.1.4) containing a reference or catalogue plant item from which a specific item in an actual or intended process plant is derived.

The following application objects are used by the variance_and_derivation UoF:

– Alternative_association_between_objects;

– Derivative_association_between_objects;

– Version_association_between_objects.

4.2   Application objects

This subclause specifies the application objects for the Functional data and their schematic representation for process plant application protocol. Each application object is an atomic element that embodies a unique application concept and contains attributes specifying the data elements of the object. The application objects and their definitions are given below.

4.2.1   2d_box_dimensions

A 2d_box_dimensions is a type of Information_content (see 4.2.98) that is a description of a rectangular shape by width and height.

NOTES

1 – A 2d_box_dimensions can be associated by a Clipping_box_for_derivation (see 4.2.45) with a View_derivation_for_annotation_element (see 4.2.187) to describe the clipping box of a view.

In this case the width and height directions are defined with respect to the co-ordinate axes of the Annotation_element that is derived by the view.

2 – A 2d_box_dimensions can be associated by a Text_box_for_annotation_text (see 4.2.173) with an Annotation_text (see 4.2.14) to describe the box within which the Annotation_text is fitted.

In this case the width and height directions are defined with respect to the co-ordinate axes of the Annotation_text.

The data associated with a 2d_box_dimensions are the following:

– height;

– width.

4.2.1.1   height

The height specifies the Numeric_value (see 4.2.112) that describes the length dimension of the 2D box in the direction of the y axis.

4.2.1.2   width

The height specifies the Numeric_value (see 4.2.112) that describes the length dimension of the 2D box in the direction of the x axis.

4.2.2   2d_curve

A 2d_curve is a type of Information_content (see 4.2.98) that is a mathematical description of a curve (see 3.3) within a 2D geometric space.

A 2d_curve is one of the following, a B-spline, circle, composite curve, ellipse, offset curve, polyline, straight line, and trimmed curve.

> NOTES
>
> 1 – The different types of mathematical description of a curve are defined within the AIM EXPRESS short listing (see 5.2).
>
> 2 – A 2d_curve can describe an outer or inner boundary of an Annotation_area (see 4.2.10) or a centre line of an Annotation_curve (see 4.2.11).
>
> EXAMPLES
>
> 22 – The polyline description of the centre line of the area of colour that represents the Piping_segment S12 on the P&ID in annex L is a 2d_curve.
>
> 23 – The polyline description of the bounding curve of the area of colour that represents the globe valve V4 on the P&ID in annex L is a 2d_curve.

4.2.3   2d_direction_range

A 2d_direction_range is a type of Information_content (see 4.2.98) that is a mathematical description of a range of directions within a 2D geometric space.

> NOTE 1 – A 2d_direction_range can be associated with a Connector_feature_of_annotation_element (see 4.2.67) to describe the valid range of directions for centre lines of Annotation_curves (see 4.2.11) connected to the Connector_feature_of_annotation_element.

In this case, the reference direction for the range is the x axis of the co-ordinate system of the Connector_feature_of_annotation_element.

The data associated with a 2d_direction_range are the following:

– from;

– to.

4.2.3.1   from

The from specifies the Numeric_value (see 4.2.112) that describes the minimum angular separation from the reference direction in an anti-clockwise sense.

4.2.3.2   to

The to specifies the Numeric_value (see 4.2.112) that describes the maximum angular separation from the reference direction in an anti-clockwise sense.

4.2.4   2d_placement

A 2d_placement is a type of Information_content (see 4.2.98) that is a mathematical description of the relationship between two sets of co-ordinate axes within a 2D geometric space.

NOTES

1 – The form of the mathematical description of a relationship between co-ordinate systems is defined within the AIM EXPRESS short listing (see 5.2).

2 – A 2d_placement can be associated with a Display_of_annotation_element_on_physical_information_carrier (see 4.2.85) to describe the relationship between the co-ordinate system of an Annotation_element (see 4.2.12) and the co-ordinate system of a Physical_information_carrier (see 4.2.124).

The association is a Description_of_display_by_placement (see 4.2.77).

3 – A 2d_placement can be associated with a Relative_placement_of_annotation_element
(see 4.2.162) to describe the relationship between the co-ordinate systems of two different Annotation_elements (see 4.2.12).

The association is a Description_of_relative_placement (see 4.2.82).

4.2.5   2d_scale

A 2d_scale is a type of Information_content (see 4.2.98) that is a description of a mapping between the shapes of two objects.

The description is such that each point in the source object described by co-ordinates:

$$(x, y)$$

is mapped to a point in the derived object described by co-ordinates:

$$(F_x.x + C_x, F_y.y + C_y)$$

where:

F_x: denotes the x_scale factor;

F_y: denotes the y_scale factor;

C_x: denotes a shift in the x axis direction that is not described by a 2d_scale; and

C_y: denotes a shift in the y axis direction that is not described by a 2d_scale.

NOTE 1 – A 2d_scale can be associated by a Scaling_for_derivation (see 4.2.167) with a Derivation_of_annotation_element (see 4.2.75) to describe the scaling of the derivation process.

In this case the x and y co-ordinate axis scale factors are defined with respect to the co-ordinate axes of the source and derived Annotation_elements.

The data associated with a 2d_scale are the following:

– x_scale;

– y_scale.

4.2.5.1 x_scale

The x_scale specifies the Numeric_value (see 4.2.112), denoted F_x above, by which a dimension of the source object in the x co-ordinate direction is multiplied to give a corresponding dimension in the derived object.

4.2.5.2 y_scale

The y_scale specifies the Numeric_value, denoted F_y above, by which a dimension of the source object in the y co-ordinate direction is multiplied to give a corresponding dimension in the derived object.

4.2.6 2d_vector

A 2d_vector is a type of Information_content (see 4.2.98) that is a mathematical description of a range of vector with magnitude and direction within a 2D geometric space.

NOTES

1 – The form of the mathematical description of a vector within a 2D geometric space is defined within the AIM EXPRESS short listing (see 5.2).

2 – A 2d_vector can be associated with a Hatching_derivation_for_annotation_element (see 4.2.91), to describe the orientation and spacing of an array of parallel Annotation_curves.

The placement co-ordinate system (see 3.3) for the 2d_vector is given by the derived Annotation_element.

3 – A 2d_vector can be associated with a Tiling_derivation_for_annotation_element (see 4.2.174), as part of a Tiling_pattern (see 4.2.175), to describe the orientation and spacing of an array of Annotation_elements.

The placement co-ordinate system (see 3.3) for the 2d_vector is given by the derived Annotation_element.

4.2.7   Activity

An Activity is a type of Typical_or_specific_object (see 4.2.177) that is something happening. Within the scope of this part of ISO 10303, an activity is one of:

–   a process Activity (see 3.5.24);

A process activity transforms or transports a Process_material (see 4.2.136).

–   a Design (see annex M, instance 2) or Assess (see annex M, instance 1) Activity.

A Design activity creates or changes a requirement, plan or prediction. An Assess activity specifies whether or not an actual object or a required, planned or predicted object is fit for a purpose.

EXAMPLES

24 –   Deem the design pressure for valve V1a to be 15 bar is a Design (see annex M, instance 2) Activity.

25 –   Approve the process design of unit 4500 for issue to detailed engineering design, is an Assess (see annex M, instance 1) Activity.

26 –   Material flowing through the suction port of pump P-4506-A, as specified by process design case 1, in annex L, is a Transfer_material (see annex M, instance 3) Activity.

An Activity is either a Specific_object (see 4.2.168) or a Typical_object (see 4.2.178).

An Activity that is also a Specific_object has at some time, or is intended to have at some time an existence in the real world.

NOTES

1 –   A specific Activity can be derived by reference to a typical Activity.

2 –   A specific Activity can be either intended or actual.

EXAMPLES

27 –   The processing of batch "XYZ_16/12/98" by process unit "4506" on the 16th December 1998, is a specific Activity.

28 –   The approval of the process data for vessel V-4506 for issue to detailed engineering design by Fred Bloggs on the 16th December 1996, is a specific Activity.

An Activity that is a also a Typical_object is a generic, parametric or reference concept.

NOTE 3 – A typical Activity is a reference object from which an intended, and ultimately an actual, specific Activity can be derived.

EXAMPLES

29 – The process design case "case 1" for vessel V-4506 is a typical Activity.

The processing of batch "XYZ_16/12/98", described in example 27, is a specific Activity which is derived from the typical Activity.

30 – The approval procedure of J. Bloggs and Co., which is described in the procedures manual, is a typical Activity.

The approval of V-4506, described in example 28, is a specific Activity which is derived from the typical Activity.

4.2.8   Actual_object

An Actual_object is a type of Life_cycle_object (see 4.2.105) that has has existence at some time in the past, present or future. An Actual_object is the thing itself and not the intention or plan for the thing.

NOTES

1 – The term 'actual' is defined in 3.5.1.

2 – An intention or plan for a thing is an Intended_object (see 4.2.101).

3 – In an implementation of this part of ISO 10303, an instance of Actual_object can be created before the real world object comes into existence and can continue to exist after the real world object has ceased to exist.

4 – Each Information_content within the scope of this part of ISO 10303 is an Actual_object. The object, that an Information_content describes, can be an Intended_object or Actual_object.

5 – A Facility that is able to operate and produce products is an Actual_object.

6 – A Material object that has been manufactured is an Actual_object. It can have a serial number assigned by the manufacturer and an asset number assigned by the owner or operator.

EXAMPLE 31 – In annex L, the heat exchanger with tag E-4507 is an intended Facility. A specific physical component is designed or selected to perform the service with tag E-4507. This is the intended Material for which that approved design is designated E-4507-prop3.

The shell and tube heat exchanger manufactured by J. Bloggs and Co. and delivered to the Much Binding refinery to be installed as E-4507, is an actual Material object. Information about the delivered shell and tube heat exchanger that is obtained by measurement is recorded by associations with the actual Material object.

The record of the actual Material is created by Much Binding Oil Products before it has been delivered by J. Bloggs and Co., and perhaps before it has been manufactured. Much Binding Oil Products can assign the actual Material an asset number before it has been delivered.

4.2.9   Alternative_association_between_objects

An Alternative_association_between_objects is an association between two objects that indicates one object can be used instead of the other.

> NOTES
>
> 1 –   This association is used between two alternative intended Facility objects, or intended Material objects, if a choice has not yet been made.
>
> 2 –   Two alternative intended Material objects can be equally suitable as a resource for a Facility.

This association does not indicate a preferred alternative.

> NOTE 3 –   If two objects have an Alternative_association_between_objects between them, then usually there are many other application objects that are associated with each of them.
>
> Two intended Facility objects with an Alternative_association_between_objects between them would usually have components in common. These would be components that were not affected by the choice of alternative.
>
> EXAMPLE 32 –   The distillate transfer system in annex L is an intended Facility designated MB/DIST/prop1. A second design is designated MB/DIST/prop2. The association between the two intended Facility objects, that indicates they are alternatives, is an Alternative_association_between_objects.
>
> The two alternative designs have components in common. The pump P-4506-A has a Assembly_of_facility association with each of them.

The data associated with an Alternative_association_between_objects are the following:

– alternative_1;

– alternative_2.

4.2.9.1   alternative_1

The alternative_1 specifies one alternative object.

Each application object may be the alternative_1 for a Alternative_association_between_objects.

> NOTE 1 –   The application objects that can be the alternative_1 are presented in the ARM diagrams by the SELECT TYPE Controlled_object.

4.2.9.2   alternative_2

The alternative_2 specifies another alternative object.

Each application object may be the alternative_2 for a Alternative_association_between_objects.

> NOTE 1 –   The application objects that can be the alternative_2 are presented in the ARM diagrams by the SELECT TYPE Controlled_object.
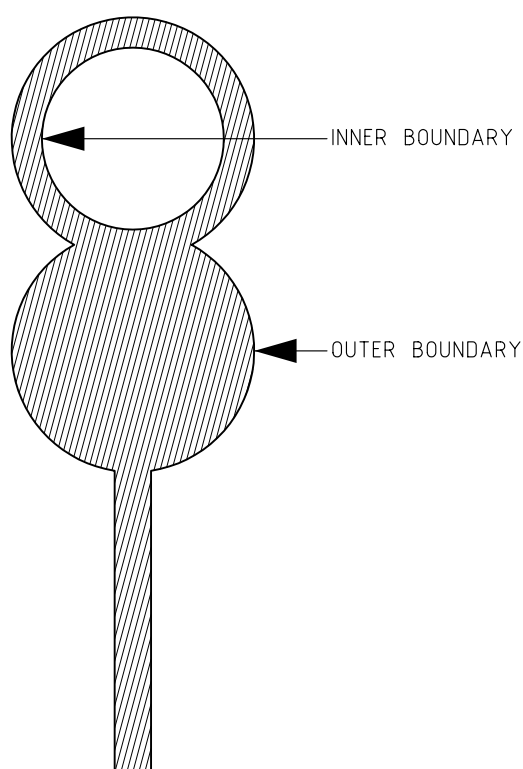
Figure 6 – An Annotation_area with an inner and outer boundary

4.2.10   Annotation_area

An Annotation_area is a type of Annotation_element (see 4.2.12) that is interpreted by a person as an enclosed area of colour, shading or texture.

An Annotation_area has a single closed curve (see 3.3) as an outer boundary and any number of closed curves as inner boundaries.

NOTES
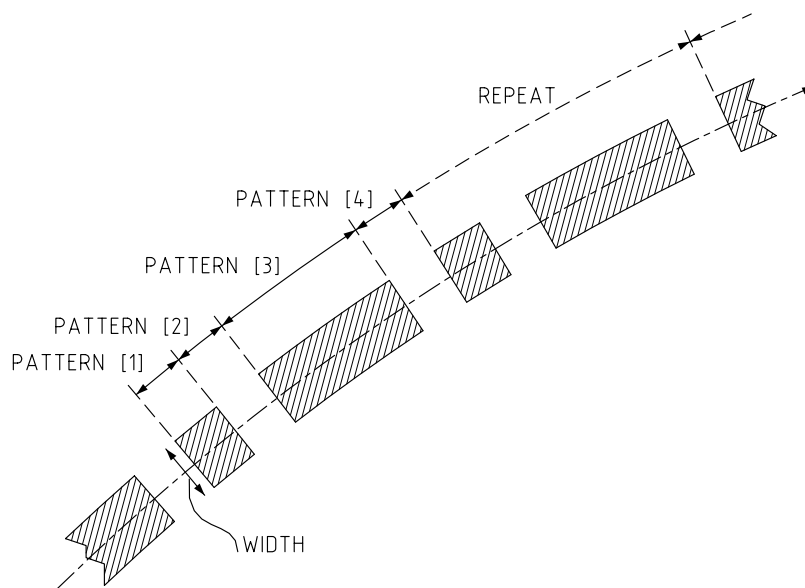
1 – An Annotation_element is a planar surface (see 3.3) of colour, shading or texture.

The boundary of the colour, shading or texture for an Annotation_area has an explicit mathematical description as closed curves (see 3.3).

2 – An Annotation_element is associated with its outer boundary curve by an Outer_boundary_for_annotation_-area (see 4.2.118), and with its inner boundaries by one or more Inner_boundary_for_annotation_area (see 4.2.100).

EXAMPLE 33 – The shaded area in figure 6 is an Annotation_area that is larger than normal. It is a presentation of a Spectacle_blind (see annex M, instance 734).

Figure 7 – An Annotation_curve with a specified Line_pattern and Line_width

4.2.11 Annotation_curve

An Annotation_curve is a type of Annotation_element (see 4.2.12) that is interpreted by a person as a curve.

> NOTES
>
> 1 – An Annotation_element is a two dimensional areas of colour, shading or texture.
>
> The boundary of the colour, shading or texture for an Annotation_curve is defined by an explicit mathematical description of its centre line curve (see 3.3), a width and a line pattern,
>
> 2 – An Annotation_curve is associated with its centre line curve by an Centre_line_for_annotation_curve (see 4.2.23).
>
> An Annotation_curve is associated with its width by a Width_for_annotation_curve (see 4.2.188).
>
> An Annotation_curve is associated with its line pattern by a Line_pattern_for_annotation_curve (see 4.2.107).
>
> EXAMPLE 34 – The shaded area in figure 7 is an Annotation_curve, that is larger than normal.

4.2.12 Annotation_element

An Annotation_element is a type of Physical_information_carrier (see 4.2.124) that is a planar two dimensional surface (see 3.3) of colour, shading or texture.

Each Annotation_element may be either an Annotation_area (see 4.2.10), an Annotation_curve (see 4.2.11), an Annotation_point (see 4.2.13), or an Annotation_text (see 4.2.14). An Annotation_element may be none of these, but instead an assembly or collection of other Annotation_elements.

An Annotation_element may be a Page_connector (see 4.2.121). An Annotation_element may be a Connector_feature_of_annotation_element (see 4.2.67).

An Annotation_element may be a Typical_object (see 4.2.178) that is not the following:

– displayed by a Display_of_annotation_element_on_physical_information_carrier (see 4.2.85); nor

– directly or indirectly part of another Annotation_element that is displayed.

NOTES

1 – An Annotation_element that is a reference concept can be the source for a Derivation_of_annotation_element (see 4.2.75).

2 – An Annotation_element can be a collection of other Annotation_elements, each of which is a Typical_object.

Such a collection of Annotation_element can be a symbol library.

3 – An Annotation_element can be areas of colour with the shapes of characters, and hence text annotation.

4 – An Annotation_element that is a collection of other Annotation_elements, each of which are reference concepts, and each of which is the shapes of a different character, is a Text_font (see annex M, instance 14).

5 – An Annotation_element can be an assembly of other annotation elements. A complete P&ID including text annotation is a single annotation element.

6 – An Annotation_element can be a collection of other Annotation_elements that are usually viewed together. Such a collection of Annotation_elements is a Layer (see annex M, instance 8).

7 – An Annotation_element can be derived by reference to another Annotation_element. If the derivation specifies which Annotation_elements in the source are visible in the derived (either by explicit selection or by means of a clipping box), then the derived Annotation_element is called a 'view'.

4.2.13   Annotation_point

An Annotation_point is a type of Annotation_element (see 4.2.12) that is interpreted by a person as a indication of position.

NOTE 1 – An Annotation_point is a surface of colour, shading or texture that has a finite extent. It is not a mathematical abstraction of infinitesimal extend.

Each Annotation_point may be a Point_marker_symbol (see 4.2.129), or a Terminator_symbol (see 4.2.170).

NOTE 2 – An Annotation_point that is neither of these does not have its boundary specified by this part of ISO 10303. Instead, the user must specify the boundary of the Annotation_point.

4.2.14 Annotation_text

An Annotation_text is a type of Annotation_element (see 4.2.12) that is interpreted by a person as one or more characters.

NOTES

1 – An Annotation_text is associated with the Text that it presents by a Presentation_of_object_by_annotation_-element (see 4.2.135).

2 – An Annotation_text is associated with information that defines the shape of the characters by an Appearance_for_annotation_text. (see 4.2.15).

An Annotation_text is associated with information about the physical space that it occupies by a Text_box_-for_annotation_text (see 4.2.173).

EXAMPLE 35 – The shaded area in figure 8 is an Annotation_text, that is larger than normal. This Annotation_text is assembled from three separate instances of Annotation_text that are the characters "45", "FT" and "501".

The specification of the relative placement of the three separate instances of Annotation text is simplified if each is Centre_justified (see annex M, instance 5).

The position of the origin of the coordinate system for an Annotation_text, with respect to the areas of colour, shading or texture that are the characters, depends upon the justification, as follows:

– If the text is Left_justified (see annex M, instance 10), then the visual left position of the text is a vertical line with a zero x coordinate. Most of the points within the Annotation_text have a positive x coordinate position.

– If the text is Centre_justified (see annex M, instance 5), then the visual centre position of the text is a vertical line with a zero x coordinate. The extreme points of the Annotation_text to the right and left have x coordinate positions of approximately equal magnitude.

– If the text is Right_justified (see annex M, instance 13), then the visual right position of the text is a vertical line with a zero x coordinate. Most of the points within the Annotation_text have a negative x coordinate position.

.

An Annotation_text is Centre_justified unless otherwise specified.

NOTE 3 – Each Annotation_element has an implicit coordinate system which is not explicitly recorded by an application object.

A Relative_placement_of_annotation_element (see 4.2.162) or a Description_of_display_by_placement (see 4.2.77) specifies the position and orientation of the coordinate system for an Annotation_element, and hence the position and orientation of the areas of colour, shading or texture.

The base line of the characters within the Annotation_text has a zero y coordinate. The base line defined such that the bottom of an "x" character within the Annotation_text would touch the line.

NOTE 4 – The bottom of a "p" or "g" character would be below the base line.
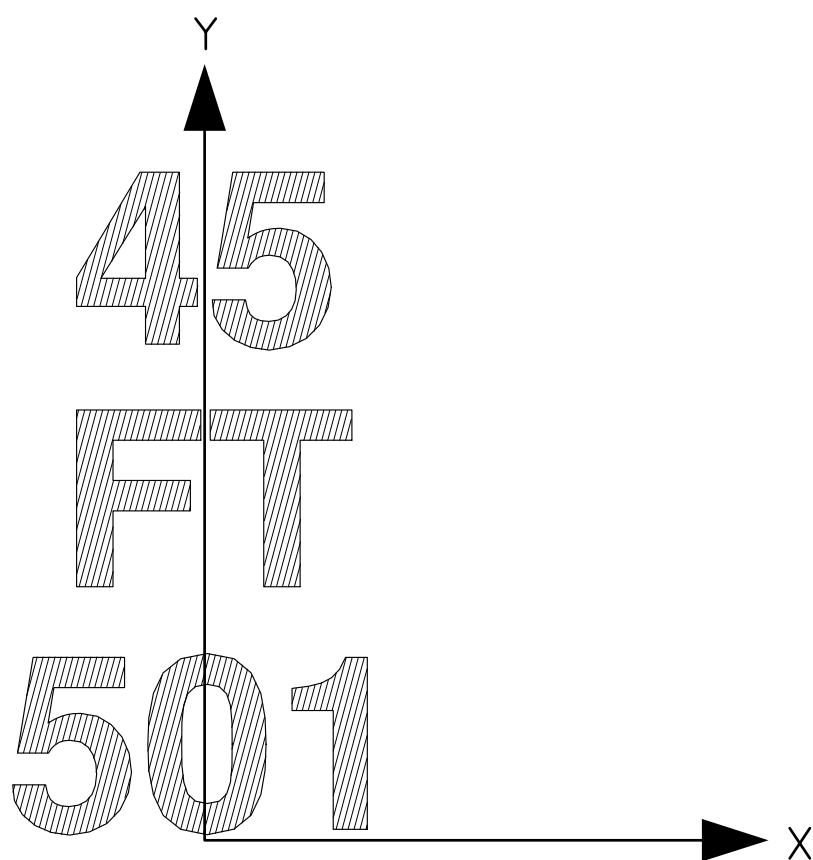
Figure 8 – An Annotation_text

4.2.15   Appearance_for_annotation_text

An Appearance_for_annotation_text is an association between an Annotation_text (see 4.2.14) and a Text_appearance (see 4.2.172) that indicates the appearance of the Annotation_text is described by the Text_appearance.

> NOTE 1 – An Annotation_text can be associated with an Annotation_element that is a Text_font (see annex M, instance 14) by a Derivation_of_annotation_element (see 4.2.75).

> Information specified directly an Appearance_for_annotation_element takes precedence over information specified for the Text_font.

The data associated with an Appearance_for_annotation_text are the following:

– described;

– describing.

4.2.15.1   described

The described specifies the Annotation_text that has the appearance.

4.2.15.2   describing

The describing specifies the Text_appearance that describes the Annotation_text.

4.2.16   Approval_of_object

An Approval_of_object is an association between an assessed object and a purpose that indicates whether or not the assessed object is approved for the Activity that is the purpose, or for an Activity of the class that is the purpose.

The meaning of the Approval_of_object association depends upon the nature of the assessed object, as follows:

Information_content: If the assessed object is an Information_content then that Information_content is approved or not approved for the purpose. The approval does not extend to an application object that the Information_content describes.

Data_record: If the assessed object is a Data_record, then that Data_record is approved or not approved for the purpose. The approval does not extend to the application object that is recorded.

any other assessed object: If the assessed object is not an Information_content or a Data_record, then it is the thing that the assessed object stands for that is approved.

NOTES

1 – The set of Data_records that contains information about a heat exchanger (say), can contain a Data_record that records the existence of the system that contains the heat exchanger. An approval of the set of Data_records for a purpose associated with design of the heat exchanger does not imply approval of the system that contains the heat exchanger.

2 – An approval of an assessed object, a heat exchanger Facility (say), does not imply the approval of any particular set of Data records. The information that is involved in the approval is not specified by this part of ISO 10303. The information involved in the approval is deduced from the class of the assessed object and the purpose.

EXAMPLES

36 – The association between the set of Data records that hold the information about the process data for heat exchanger E-4507 in annex L and the Class of Activity issue for procurement, that indicates the Data records can be issued for procurement, is an Approval of object.

37 – The association between the drawing sheet containing the P&ID in annex L (a Material object) and the Class of activity issue for engineering, that indicates the drawing sheet shall not be issued by the process department for engineering, is an Approval of object.

An Approval of object is either an Intended object (see 4.2.101 or an Actual object (see 4.2.8).

If the assessed object is an Intended object, then the intent is assessed. If the assessed object is an Actual object, then the object that exists is assessed.

An intended Approval of object records an intent that an assessed object shall be (or in exceptional circumstances shall not be) approved. An actual Approval of object records an approval (or non-approval) that exists.

The data associated with an Approval of object are the following:

– assessed;

– purpose;

– status.

4.2.16.1   assessed

The assessed specifies the object that is approved or not approved for the purpose.

Each application object may be the assessed for an Approval of object.

NOTE 1 – The application objects that can be assessed are presented in the ARM diagrams by the SELECT TYPE Assessed object.

4.2.16.2   purpose

The purpose specifies the Activity or Class of activity for which the assessed object is approved or not approved.

NOTE 1 – The different application objects that can be the purpose for an approval are presented in the ARM diagrams by the SELECT TYPE Purpose.

4.2.16.3   status

The status specifies whether the association between the assessed object and the purpose indicates that the assessed object is approved for the purpose or not approved for the purpose.

4.2.17   Assembly_of_annotation_element

An Assembly_of_annotation_element is type of Composition_of_annotation_element (see 4.2.58), that indicates the part has a particular position within respect to the composite Annotation_element.

Annotation_elements that are assembled have a relative placement within a schematic presentation that conveys information.

NOTES

1 – A complete P&ID is usually regarded as a single Annotation_element that is an assembly of many parts.

The complete P&ID is associated with its drawing sheet, a Physical_information_carrier (see 4.2.124) by a Display_of_annotation_element_on_physical_information_carrier (see 4.2.85).

2 – Two Annotation_elements associated by an Assembly_of_annotation_element need not also be associated by a Relative_placement_of_annotation_element.

The information about the relative placement of the Annotation_elements can be obtained indirectly through a chain of relative placements.

Information about an Annotation_element that is a whole applies to all of its parts, so that a colour specified for an Annotation_element that is a whole, takes precedence over any colours specified for part Annotation_elements.

EXAMPLES

38 – The association between:

– the Annotation_element that is the vessel symbol with the annotation text "V-4506", in annex L; and

– the Annotation_element that is the annotation text "V-4506",

that indicates the annotation text is part of the assembled text and symbol, is an Assembly_of_annotation_-element.

39 – The shaded area on the left of figure 9 is an Annotation_element that presents a Flow_measuring_device (see annex M, instance 121) and that is larger than normal.

It is an assembly of an Annotation_element that has a 'lolly-pop' shape, and an Annotation_text. Copies of the part Annotation_elements are the shaded areas on the right of the figure.
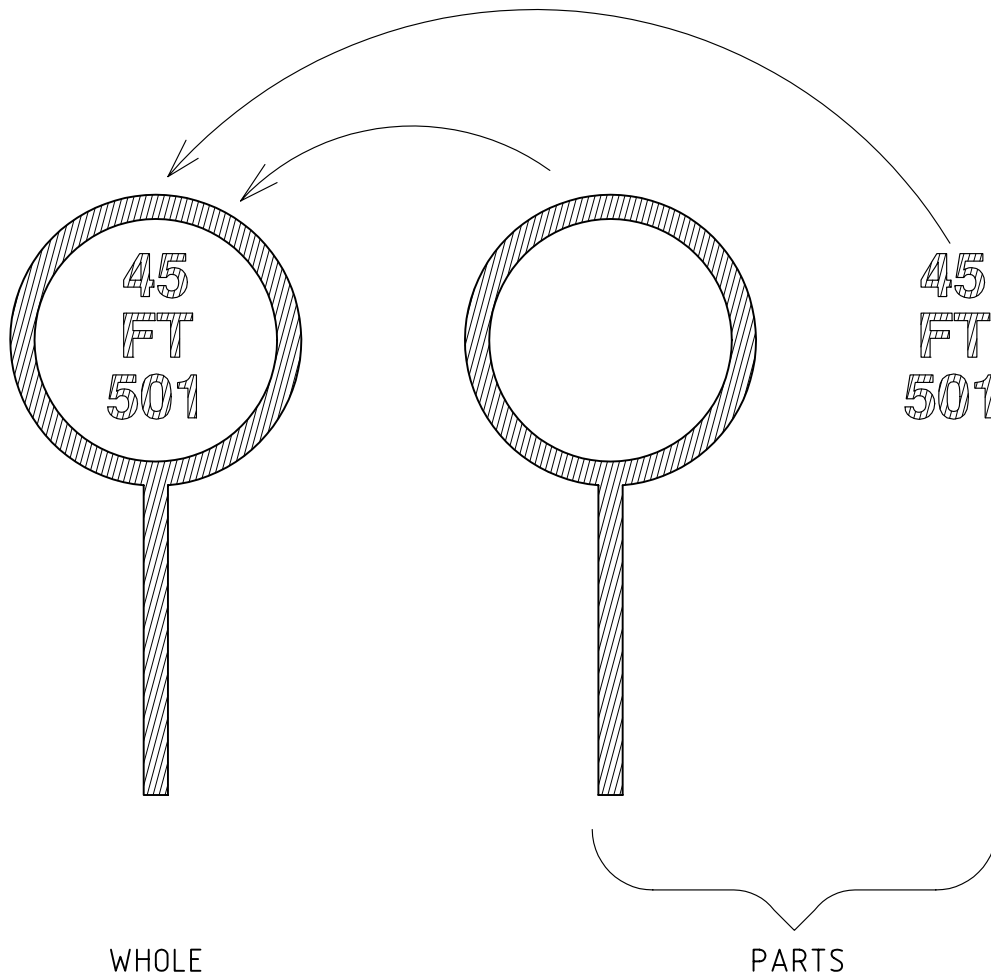
Figure 9 – An Annotation‗element that is an assembly.

4.2.18   Assembly_of_facility

An Assembly_of_facility is a type of Composition_of_facility (see 4.2.60), that indicates the part is connected to other parts of the whole in a way that enables the whole to perform an activity.

> NOTES
>
> 1 – The association Possession_of_connector_by_facility, (see 4.2.130) is used to associate a Connector_of_facility (see 4.2.68) with a Facility for which it is a connector, and not the association Assembly_of_facility.
>
> EXAMPLE 40 –   The association between the pipeline P45001 and the piping_system distributing fluid to the distillate cooler E-4507 and to the reflux vessel V-4506, that indicates the pipeline is part of the system, is an Assembly_of_facility.

4.2.19   Assembly_of_material

An Assembly_of_material is a type of Composition_of_material (see 4.2.62), that indicates the part is connected to other parts or has a position with respect to other parts so that the whole can do a duty.

> EXAMPLE 41 –   The association between the impeller and the complete pump that provides the service for Facility P-4506-A in annex L, that indicates the impeller is assembled as part of the complete pump, is an Assembly_of_material.
>
> NOTE 1 –   An Assembly_of_material can apply to Material objects that are Physical_information_carriers (see 4.2.124).
>
> EXAMPLE 42 –   The association between the Physical_information_carrier with name "ESD/DJL/1234: Structural integrity report on Vessel V-4506" and the Physical_information_carrier with name "MBB/SCR/12345: Much Binding B safety case report", that indicates the structural integrity report is part of the safety case report, is an Assembly_of_material.

4.2.20   Beginning_effect

A Beginning_effect is a type of Beginning_or_end_effect (see 4.2.21) that is the beginning of an object.

> NOTE 1 –   A change to the real world is recorded by the beginning or end of an application object.
>
> EXAMPLE 43 –   The intended Facility, that is valve V1a in annex L, has an intended operating pressure of 15 bar. If the intended operating pressure is changed to 16 bar, then:
>
> – the association between the valve and the operating pressure of 15 bar (a Property) ends; and
>
> – the association between the valve and the operating pressure of 16 bar (a different Property) begins.
>
> The beginning of the association Possession_of_property_by_object between the valve V1a (a Facility) and the operating pressure of 16 bar (a Property) is a Beginning_effect.

4.2.21   Beginning_or_end_effect

A Beginning_or_end_effect is the beginning or end of an object.

A Beginning_or_end_effect shall be either a Beginning_effect (see 4.2.20) or an End_effect (see 4.2.86).

NOTE 1 – A change to the world is recorded by the beginning or end of an application object.

EXAMPLE 44 – The intended Facility, that is valve V1a in annex L, has an intended operating pressure of 15 bar. If the intended operating pressure is changed to 16 bar, then:

– the association between the valve and the operating pressure of 15 bar (a Property) ends; and

– the association between the valve and the operating pressure of 16 bar (a different Property) begins.

A Beginning_or_end_effect is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

If an object is intended, then a Beginning_or_end_effect records the beginning or end of the intent. If an object is actual, then a Beginning_of_end_effect records the beginning or end of the actual existence.

An intended Beginning_or_end_effect records an intended beginning or end. An actual Beginning_or_end_effect records an actual beginning or end.

NOTES

2 – An object can have only one actual beginning and only one actual end, but any number of intended beginnings and ends.

3 – An Actual_object can have an intended beginning. In this case, the record of the Actual_object has been created before the object itself has come into existence.

The data associated with a Beginning_or_end_effect are the following:

– cause;

– what;

– when; and

– where.

4.2.21.1   cause

The cause specifies the object that is the cause of the Beginning_or_end_effect.

The application objects that may be a cause are as follows:

– Activity;

– Beginning_or_end_effect.

NOTE 1 – The different application objects that can be a cause are presented in the ARM diagrams by the SELECT TYPE Cause.

A cause need not be specified for a Beginning_or_end_effect.

4.2.21.2   what

The what specifies the effected object that begins or ends.

A beginning or end may be specified for each application object except Point in space (see 4.2.125) and Point in time (see 4.2.128).

> NOTE 1 – The application objects that can have a beginning or end specified are presented in the ARM diagrams by the SELECT TYPE Effected object.

A what need not be specified for a Beginning or end effect.

4.2.21.3   when

The when specifies the Point in time of the Beginning or end effect.

A when need not be specified for a Beginning or end effect.

The Point in time for a Beginning or end effect is the time at which the effected object begins or ends. It is not the Point in time at which the Data record that stands for the effected object begins or ends.

> EXAMPLE 45 – The Beginning effect for the actual Material vessel that is the resource for Facility V-4506 in annex L has a Point in time within the manufacturing process. (Exactly when during the manufacturing process from steel billet to finished vessel, the vessel is deemed to come into existence is a business decision, that is not prescribed by this part of ISO 10303.)
>
> NOTES
>
> 1 – The Beginning effect for the Data record that stands for the actual Material vessel can have a Point in time before or after the Beginning effect for the actual Material vessel. Consider two cases:
>
> – A new data base is created for existing assets. In this case the Beginning effect for the Data record is after the Beginning effect for the actual Material.
>
> – A Data record is created to hold asset registration information about an actual Material that does not yet exist. In this case the Beginning effect for the Data record is before the Beginning effect for the actual Material.
>
> 2 – An actual Material can have any number of intended Beginning effects or intended End effects at instances of Date and time in the future. An actual Material has only one actual Beginning effect or actual End effect, and at a Date and time in the past.

4.2.21.4   where

The where specifies the Point in space of the Beginning or end effect.

A where need not be specified for a Beginning or end effect.

> NOTE 1 – The Point in space for a Beginning or end effect is the place at which the effected object begins or ends. It is not the Point in space at which the Data record that records the effected object begins or ends.

4.2.22   Binary object

A Binary object is a type of Information content (see 4.2.22) that is a sequence of bits intended to be processed by an application program.

NOTES

1 – The sequence of bits does not necessarily correspond to a sequence of printable characters.

2 – There are no standard classes of Binary_object in this part of ISO 10303. The format of a Binary_object can be specified by a user defined Class_of_information_content.

3 – A Binary_object can be a picture, video sequence or sound sequence.

EXAMPLE 46 – The GIF file for the P&ID in annex L is a Binary_object.

The data associated with a Binary_object are the following:

– content.

The content is the sequence of bits that is the Binary_object.

4.2.23 Centre_line_for_annotation_curve

A Centre_line_for_annotation_curve is an association between an Annotation_curve (see 4.2.11) and a 2d_curve (see 4.2.2) that indicates the 2d_curve describes the centre line of the Annotation_curve.

The coordinate system of the Annotation_curve is the placement coordinate system (see 3.3) of the 2d_-curve.

The data associated with a Centre_line_for_annotation_curve are the following:

– described;

– describing.

4.2.23.1 described

The described specifies the Annotation_curve that has the centre line.

4.2.23.2 describing

The describing specifies the 2d_curve that is a description of the centre line.

4.2.24 Class_of_activity

A Class_of_activity is an abstract concept that indicates the nature of an Activity (see 4.2.7), and that is a basis for dividing Activities into those which are members and those which are not.

NOTES

1 – An Activity is classified by an association with a Class_of_activity.

2 – Standard instances of Class_of_activity are defined by this part of ISO 10303.

The standard instances of Class_of_activity are defined in M.1.

4.2.25   Class_of_annotation_element

A Class_of_annotation_element is an abstract concept that indicates either:

–   the meaning expected to be communicated to a Person by an Annotation_element; or

> EXAMPLE 47 – Valve_symbol is a Class_of_annotation_element that indicates a member presents a Valve_system (see annex M, instance 466). This is not a specified instance of Class_of_annotation_-element.

–   the physical form of an Annotation_element.

> EXAMPLE 48 – Draughting_callout is a Class_of_annotation_element that indicates a member is a block of textual information. This is a specified instance of Class_of_annotation_element (see annex M, instance 6).

NOTES

1 – An Annotation_element is classified by an association with a Class_of_annotation_element.

2 – A collection of Class_of_annotation_element objects is itself a Class_of_annotation_element.

3 – A Class_of_annotation_element that is a collection is a class library, or dictionary of classes, for Annotation_elements.

4 – Standard Class_of_annotation_element objects are defined by this part of ISO 10303. Further classes can be defined by a user.

The standard instances of Class_of_annotation_element are defined in M.2.

4.2.26   Class_of_facility

A Class_of_facility is an abstract concept that indicates the nature of a Facility (see 4.2.89) and that is a basis for dividing Facilities into those that are members and those that are not.

NOTES

1 – A Facility is classified by an association with a Class_of_facility.

2 – A Class_of_facility does not indicate the nature of a Material that provides the service for a Facility.

3 – A collection of Class_of_facility objects is itself a Class_of_facility.

A Class_of_facility that is a collection is a class library, or dictionary of classes, for Facility.

EXAMPLE 49 –   The Facility classification scheme for J. Bloggs and Co. is a Class_of_facility.

This class library contains the standard Class_of_facility polypropylene_unit defined by this part of ISO 10303. The class library also contains Class_of_facility objects defined by J. Bloggs and Co..

NOTE 4 – A Class_of_facility can be appropriate to a Facility that is a Logical_information_carrier (see 4.2.108) rather than to a Facility that can transfer or transform a Process_material.

EXAMPLE 50 – STEP_repository is a Class_of_facility.

NOTE 5 – Standard Class_of_facility objects are defined by this part of ISO 10303. Further classes can be defined by a user.

The standard instances of Class_of_facility are defined in M.3.

4.2.27   Class_of_information_content

A Class_of_information_content is an abstract concept that indicates either:

– the nature of the meaning that is within Information_content; or

– the formalism that is used by Information_content, such as the English language or SGML.

NOTES

1 – An Information_content is classified by an association with a Class_of_activity.

2 – A Class_of_information_content does not indicate the nature of the information holder for an Information_content.

A collection of Class_of_information_content objects is itself a Class_of_information_content.

3 – A Class_of_information_content that is a collection is a class library, or dictionary of classes, for Information_content.

4 – Standard Class_of_information_content objects are defined by this part of ISO 10303. Further classes can be defined by a user.

The standard instances of Class_of_information_content are defined in M.4.

EXAMPLES

51 – The GIF characters that are a computer sensible representation of the P&ID within annex L are an Information_content that is classified as follows:

P&ID: a Class_of_information_content defined by this part of ISO 10303.

GIF: a Class_of_information_content that is not defined by this part of ISO 10303.

52 – Engineering change notice is a Class_of_information_content that is not defined by this part of ISO 10303.

53 – Centrifugal pump data sheet of J. Bloggs and Co. is a Class_of_information_content that is not defined by this part of ISO 10303.

54 – SGML is a Class_of_information_content that is not defined by this part of ISO 10303.

55 – The J. Bloggs and Co. asset identifier is a Class_of_information_content. This Class_of_information_content can be associated with the Organization (see 4.2.114) J. Bloggs and Co. by a Maintenance_of_identification_scheme association (see 4.2.109).

4.2.28   Class_of_information_content_held_by_information_carrier

A Class_of_information_content_held_by_information_carrier is an association between an information holder and a Class_of_information_content (see 4.2.27), that indicates the Information_content held by the information holder is a member of the class.

EXAMPLES

56 – The association between:

– the Physical_information_carrier that is document with reference "MBB/SCR/12345" holding the Much Binding B safety case report; and

– the Class_of_information_content safety_case_report,

that indicates the held Information_content is a member of the class, is a Class_of_information_content_held_by_information_carrier.

The Physical_information_carrier in this example can also be classified by its Class_of_material as a document.

57 – The association between:

– the file with name "mbb_scr_12345.tex" that holds the Much Binding B safety case report; and

– the Class_of_information_content safety_case_report,

that indicates the held Information_content is a member of the class, is a Class_of_information_content_held_by_information_carrier.

The Logical_information_carrier in this example can also be classified by its Class_of_facility as a computer_file.

The data associated with a Class_of_information_content_held_by_information_carrier are the following:

– held;

– holder.

4.2.28.1   holder

The holder specifies the Logical_information_carrier (see 4.2.108) or Physical_information_content (see 4.2.108) that holds the Information_content that is a member of the Class_of_information_content.

NOTE 1 – The different application objects that can be an information holder are presented in the ARM diagrams by the SELECT TYPE Holder.

4.2.28.2 held

The held specifies the Class_of_information_content that the Information_content held by the information holder is a member of.

4.2.29 Class_of_involvement

A Class_of_involvement is an abstract concept that indicates the nature of an Involvement_of_object_in_activity (see 4.2.103) association, and hence the nature of the role that the involved object plays in the Activity.

NOTES

1 – An Involvement_of_object_in_activity is classified by an association with a Class_of_involvement.

2 – Standard instances of Class_of_involvement are defined by this part of ISO 10303. Further instances can be defined by a user.

The standard instances of Class_of_involvement are defined in M.5.

4.2.30 Class_of_material

A Class_of_material is an abstract concept that indicates the nature of a Material object (see 4.2.110) and that is a basis for dividing Material objects into those that are members and those that are not.

NOTES

1 – A Material object is classified by association with a Class_of_material.

2 – A Class_of_material does not indicate the nature of a Facility for which a Material object is the resource.

3 – A collection of Class_of_material objects is itself a Class_of_material.

A Class_of_material that is a collection is a class library, or dictionary of classes, for Material objects.

EXAMPLE 58 – The material classification scheme for J. Bloggs and Co. is a Class_of_material.

This class library contains the standard Class_of_material reciprocating_pump defined by this part of ISO 10303. The class library also contains Class_of_material objects defined by J. Bloggs and Co..

NOTE 4 – A Class_of_material can be appropriate to a Material that is a Physical_information_carrier (see 4.2.124) rather than to a Material that can be a resource for a Facility within a process plant.

EXAMPLE 59 – Microfiche is a Class_of_material.

NOTE 5 – Standard Class_of_material objects are defined by this part of ISO 10303. Further classes can be defined by a user.

The standard instances of Class_of_material are defined in M.6.

4.2.31 Class_of_property

A Class_of_property is an abstract concept that indicates the nature of a Property (see 4.2.137) and that is a basis for dividing Properties into those that are members and those that are not.

> NOTES
>
> 1 – A Property is classified by an association with a Class_of_property.
>
> 2 – A collection of Class_of_property objects is itself a Class_of_property.
>
> A Class_of_property that is a collection is a class library, or dictionary of classes, for Properties.
>
> EXAMPLE 60 – The Property classification scheme for J. Bloggs and Co. is a Class_of_property).
>
> This class library contains the standard Class_of_facility net_positive_suction_head defined by this part of ISO 10303. The class library also contains Class_of_property objects defined by J. Bloggs and Co..
>
> NOTE 3 – Standard instances of Class_of_property are defined by this part of ISO 10303. Further instances can be defined by a user.

The standard instances of Class_of_property are defined in M.7.

4.2.32 Class_of_substance

A Class_of_substance is a Class_of_material that indicates the nature, structure and state of a substance that forms a Material object.

A Class_of_substance does not indicate the external shape of a Material object or its structure as a composition of Material objects.

A Material may be classified by association with a Class_of_substance.

> NOTES
>
> 1 – A Class_of_substance can be a construction_material as defined in 3.5.8. A Material plant item can be classified by such a Class_of_substance to indicate what it is made of.
>
> 2 – A Process_material (see 4.2.136) can be classified by a Class_of_substance that is not a construction_material.
>
> 3 – A Material object can be classified separately by:
>
> – its external shape and composition; and
>
> – the nature, structure and state of its substance.
>
> Hence a Material object can be associated with both a Class_of_material and a Class_of_substance.

The concept of substance may depend upon both the external shape and the composition of a Material object, so that it is not possible to classify a Material separately by a Class_of_material and a Class_of_substance. In this case a Material object is classified by a Class_of_material alone.

NOTE 4 – Standard Class_of_substance objects are defined by this part of ISO 10303. Further instances can be defined by a user.

The standard instances of Class_of_substance are defined in M.8.

4.2.33   Classification_of_activity

A Classification_of_activity is an association between an Activity (see 4.2.7), and a Class_of_activity (see 4.2.24), that indicates the Activity is a member of the class.

EXAMPLE 61 – The association between the Activity - check the process data for pump P-4606A, and the Class_of_activity assess, that indicates the nature of the Activity, is a Classification_of_activity.

The data associated with a Classification_of_activity are the following:

– classified;

– classifier.

4.2.33.1   classified

The classified specifies the Activity that is a member of the Class_of_activity.

4.2.33.2   classifier

The classifier specifies the Class_of_activity that has the classified Activity as a member.

4.2.34   Classification_of_annotation_element

A Classification_of_annotation_element is an association between an Annotation_element (see 4.2.12) and a Class_of_annotation_element (see 4.2.25), that indicates the Annotation_element is a member of the class.

The data associated with a Classification_of_annotation_element are the following:

– classified;

– classifier.

4.2.34.1   classified

The classified specifies the Annotation_element that is a member of the Class_of_annotation_element.

4.2.34.2   classifier

The classifier specifies the Class_of_annotation_element that has the Annotation_element as a member.

4.2.35 Classification_of_class_of_annotation_element

A Classification_of_class_of_annotation_element is an association between two Class_of_annotation_element objects (see 4.2.25) (classifier and classified), that indicates each member of the classified class is also a member of the classifier class.

> EXAMPLE 62 – The association between the Class_of_annotation_element ball_valve_symbol and the Class-_of_annotation_element valve_symbol, that indicates a ball_valve_symbol is also a valve_symbol, is a Classification_of_class_of_annotation_element.

The data associated with a Classification_of_class_of_annotation_element are the following:

– classified;

– classifier.

4.2.35.1   classified

The classified specifies the Class_of_annotation_element that is the narrower concept, and that is contained within the classifier Class_of_annotation_element.

4.2.35.2   classifier

The classified specifies the Class_of_annotation_element that is the broader concept, and that contains the classified Class_of_annotation_element.

4.2.36 Classification_of_class_of_facility

A Classification_of_class_of_facility is an association between two Class_of_facility objects (see 4.2.26) (classifier and classified), that indicates each member of the classified class is also a member of the classifier class.

> NOTES
>
> 1 – The classifier class is the broader concept and the classified class is the narrower concept.
>
> 2 – Standard Classification_of_class_of_facility objects are not defined by this part of ISO 10303.
>
> EXAMPLE 63 – The association between the Class_of_facility oily_water_drainage_system and the Class-_of_facility drainage_system, that indicates each oily_water_drainage_system Facility is also a drainage_system Facility, is a Classification_of_class_of_facility.

A classification of a Facility by the classified (narrower) class records all the information that is recorded by a classification by the classified (broader) class.

The data associated with a Classification_of_class_of_facility are the following:

– classified;

– classifier.

4.2.36.1 classified

The classified specifies the Class_of_facility that is the narrower concept, and that is contained within the classifier Class_of_facility.

4.2.36.2 classifier

The classified specifies the Class_of_facility that is the broader concept, and that contains the classified Class_of_facility.

4.2.37 Classification_of_class_of_material

A Classification_of_class_of_material is an association between two Class_of_material objects (see 4.2.30) (classifier and classified), that indicates each member of the classified class is also a member of the classifier class.

> NOTES
>
> 1 – The classifier class is the broader concept and the classified class is the narrower concept.
>
> 2 – Standard Classification_of_class_of_material objects are not defined by this part of ISO 10303. Further classifications of class can be defined by a user.
>
> EXAMPLE 64 – The association between the Class_of_material Ball_valve (see annex M, instance 1015) and the Class_of_material Valve (see annex M, instance 1063), that indicates each Ball_valve Material object is also a Valve Material object, is a Classification_of_class_of_material.

A classification of a Material by the classified (narrower) class records all the information that is recorded by a classification by the classified (broader) class.

The data associated with a Classification_of_class_of_material are the following:

– classified;

– classifier.

4.2.37.1 classified

The classified specifies the Class_of_facility that is the narrower concept, and that is contained within the classifier Class_of_facility.

4.2.37.2 classifier

The classified specifies the Class_of_material that is the broader concept, and that contains the classified Class_of_material.

4.2.38 Classification_of_facility

A Classification_of_facility is an association between a Facility (see 4.2.89) and a Class_of_facility (see 4.2.26), that indicates the Facility is a member of the class.

NOTE 1 – A Facility within a process plant can have more than one classification.

EXAMPLE 65 – The association between control valve 45-FCV-501 in annex L and the Class_of_facility Control_valve (see annex M, instance 446), that indicates the nature of the Facility, is a Classification_of_-facility.

The data associated with a Classification_of_facility are the following:

– classified;

– classifier.

4.2.38.1 classified

The classified specifies the Facility that is a member of the Class_of_facility.

4.2.38.2 classifier

The classifier specifies the Class_of_facility that has the classified Facility as a member.

4.2.39 Classification_of_information_content

A Classification_of_information_content is an association between an Information_content (see 4.2.98) and a Class_of_information_content (see 4.2.27), that indicates the Information_content is a member of the class.

EXAMPLES

66 – The association between the GIF Text that is a computer sensible representation of the P&ID within annex L and the Class_of_information_content P&ID, that classifies the Text as a P&ID, is a Classification_-of_information_content.

67 – The association between the GIF Text that is a computer sensible representation of the P&ID within annex L and the Class_of_information_content GIF, that classifies the Text as GIF, is a Classification_of_-information_content.

68 – The association between the Text "P-4506-A" and the Class_of_information_content J. Bloggs and Co. facility_identifier, that classifies the Text as a J. Bloggs and Co. Facility identifier, is a Classification_of_-information_content.

The data associated with a Classification_of_information_content are the following:

– classified;

– classifier.

4.2.39.1 classified

The classified specifies the Information_content that is a member of the Class_of_information_content.

4.2.39.2 classifier

The classifier specifies the Class_of_information_content has the classified Information_content as a member.

4.2.40 Classification_of_involvement

A Classification_of_involvement is an association between an Involvement_of_object_in_activity (see 4.2.103) and a Class_of_involvement (see 4.2.29), that indicates the Involvement_of_object_in_activity is a member of the class.

> EXAMPLE 69 – The association between the typical Process_material design_case_1_input_stream that flows through the suction port of pump P-4506-A, specified by design case 1 in annex L), and the typical Activity design_case_1_pumping, that indicates the typical Material is involved in the Activity, is an Involvement_of_-object_in_activity.
>
> The association between this Involvement_of_object_in_activity and the Class_of_involvement input_material, that indicates the nature of the involvement, is a Classification_of_involvement.

The data associated with a Classification_of_involvement are the following:

 – classified;

 – classifier.

4.2.40.1 classified

The classified specifies the Involvement_of_object_in_activity that is a member of the Class_of_involvement.

4.2.40.2 classifier

The classifier specifies the Class_of_involvement that has the Involvement_of_object_in_activity as a member.

4.2.41 Classification_of_material_by_class_of_substance

A Classification_of_material_by_class_of_substance is a type of Classification_of_material (see 4.2.42) that associates a Material object with a Class_of_substance to indicate the nature, structure and state of the substance that forms the Material object.

The data associated with a Classification_of_material_by_class_of_substance are the following:

 – classified;

– classifier.

EXAMPLE 70 – The association between the Material object that is the vessel V-4506 in annex L and the Class_of_substance carbon_steel is a Classification_of_material_by_class_of_substance.

4.2.41.1 classified

The classified specifies the Material object that is a member of the Class_of_substance.

4.2.41.2 classifier

The classifier specifies the Class_of_substance that has the classified Material object as a member.

4.2.42 Classification_of_material

A Classification_of_material is an association between a Material object (see 4.2.110) and a Class_of_material (see 4.2.30), that indicates the Material object is a member of the class.

NOTE 1 – A Material object within a process plant can have more than one classification.

EXAMPLE 71 – The association between the Material object providing the service for the heat exchanger E-4507 in annex L and the Class_of_material shell_and_tube_heat_exchanger, that indicates the nature of the Material object, is a Classification_of_material.

Shell_and_tube_heat_exchanger is a standard Class_of_material defined by this part of ISO 10303. The Material also has the classification pressure_part defined by J. Bloggs and Co., that indicates the department responsible for its certification.

The data associated with a Classification_of_material are the following:

– classified;

– classifier.

4.2.42.1 classified

The classified specifies the Material object that is a member of the Class_of_material.

4.2.42.2 classifier

The classifier specifies the Class_of_material that has the Material object as a member.

4.2.43 Classification_of_process_material_by_phase

A Classification_of_process_material_by_phase is a type of Classification_of_material that associates a Process_material (see 4.2.136) and a Phase (see 4.2.123) to indicate the Process_material is in the Phase.

EXAMPLE 72 – The association between the typical Process_material design_case_1_input_stream that flows through the suction port of pump P-4506-A, specified by design case 1 in annex L), and the Phase Liquid (see annex M, instance 1283), that indicates the Phase of the Process_material, is a Classification_of_process_-material_by_phase.

The data associated with a Classification_of_process_material_by_phase are the following:

– classified;

– classifier.

4.2.43.1 classified

The classified specifies the Process_material that is of the Phase. classified.

4.2.43.2 classifier

The classifier specifies the Phase of the Process_material.

4.2.44 Classification_of_property

A Classification_of_property is an association between a Property (see 4.2.137) and a Class_of_property (see 4.2.31) that indicates the Property is a member of the class.

EXAMPLES

73 – The association between the operating pressure of 15 bar gauge, that is possessed by vessel V-4506 in annex L, and the Class_of_property operating_pressure is a Classification_of_property.

74 – The association between:

– the Property '5 in number', that is possessed by the collection of bolts used to make the connection between the flange of the inlet nozzle for V-4506 and the flange at the end of Piping_segment S12 in annex L; and

– the Class_of_property 'number',

that indicates 'number' classifies the Property, is a Classification_of_property.

75 – The association between the larger end nominal diameter of 2 inches, that is possessed by the reducer R1a in annex L, and the Class_of_property larger_end_nominal_diameter is a Classification_of_property.

The data associated with a Classification_of_property are the following:

– classified;

– classifier.

4.2.44.1   classified

The classified specifies the Property that is a member of the Class_of_property.

4.2.44.2   classifier

The classifier specifies the Class_of_property that has the Property as a member.

4.2.45   Clipping_box_for_derivation

A Clipping_box_for_derivation is an association between a View_derivation_for_annotation_element (see 4.2.187) and a 2d_box_dimensions (see 4.2.1) that indicates the source Annotation_element (see 4.2.12) for the view is clipped by the box described by the 2d_box_dimensions.

The derived Annotation_element defined by the View_derivation_of_annotation_element does not contain areas of colour, shading or texture corresponding to the parts of the source Annotation_element that are outside the clipping box.

The coordinate system of the source Annotation_element is the placement coordinate system (see 3.3) of the 2d_box_dimensions. The 2D box is placed such that its centre is at the origin of the coordinate axes for the source Annotation_element.

The data associated with a Clipping_box_for_annotation_element are the following:

– described;

– describing.

4.2.45.1   described

The described specifies the View_derivation_of_annotation_element for which the clipping box is described.

4.2.45.2   describing

The describing specifies the 2d_box_dimensions that are a description of the clipping box.

4.2.46   Collection_of_annotation_element

A Collection_of_annotation_element is a type of Composition_of_annotation_element (see 4.2.46) and an association between two Annotation_element objects (see 4.2.12) that indicates one is part of the other, but does not play a particular role within it.

NOTES

1 – An Assembly_of_annotation_element indicates that the part has a particular position within the whole and a relationship with other parts that presents information to a person.

A Collection_of_annotation_element indicates that the part does not have a particular position within the whole or a particular relationship with the other parts.

2 – An Annotation_element that is a collection can be a Layer (see annex M, instance 8).

The Annotation_elements within a Layer can have a relationship with each other that presents information to a person. This information is recorded by other associations, and not by their collection into a Layer. A Layer is an arbitrary collection of Annotation_elements.

EXAMPLE 76 – The association between the symbol representing the controller 45-FIC-501 in the P&ID in annex L and the instrumentation Layer, that indicates the controller symbol is in the Layer, is a Collection_of_annotation_element.

NOTE 3 – An Annotation_element that is a collection can be a catalogue of standard or reference Annotation_elements.

EXAMPLE 77 – The association between the the reference pump symbol and the catalogue of symbols (symbol library) of J. Bloggs and Co., that indicates the reference pump symbol is part of the catalogue, is a Collection_of_annotation_element.

The data associated with a Collection_of_annotation_element are the following:

– part;

– whole.

4.2.46.1   part

The part specifies the Annotation_element that is a member of the collected object.

4.2.46.2   whole

The whole specifies the Annotation_element that is the collected object.

4.2.47   Collection_of_class_of_annotation_element

A Collection_of_class_of_annotation_element is an association between two Class_of_annotation_element objects (see 4.2.25) that indicates one is part of the other, but does not play a particular role within it.

NOTES

1 – A collection of Class_of_annotation_element objects is itself a Class_of_annotation_element.

2 – A Class_of_annotation_element that is a collection is a class library, or dictionary of classes, for Annotation_elements.

EXAMPLE 78 – The association between the P&ID symbol classification scheme for J. Bloggs and Co. (a Class_of_annotation_element) and the Class_of_annotation_element ball_valve_symbol, that indicates ball_valve_symbol is within the classification scheme, is a Collection_of_class_of_annotation_element.

For each Class_of_annotation_element within the P&ID symbol classification scheme for J. Bloggs and Co., there are one or more typical Annotation_elements within the J. Bloggs and Co. symbol library.

The classification scheme is about the meanings of symbols, and the symbol library (itself a typical Annotation_element) is about the physical form of the symbols.

The data associated with a Collection_of_class_of_annotation_element are the following:

–   part;

–   whole.

4.2.47.1   part

The part specifies the Class_of_annotation_element that is a member of the collected object.

4.2.47.2   whole

The whole specifies the Class_of_annotation_element that is the collected object.

4.2.48   Collection_of_class_of_facility

A Collection_of_class_of_facility is an association between two Class_of_facility objects (see 4.2.26) that indicates one part of the other, but does not play a particular role within it.

NOTE 1 –   A collection of Class_of_facility objects is itself a Class_of_facility.

A Class_of_facility that is a collection is a class library, or dictionary of classes, for Facilities.

EXAMPLE 79 –   The association between the Facility classification scheme for J. Bloggs and Co. (a Class_of_facility) and the Class_of_facility polypropylene_unit, that indicates polypropylene_unit is within the classification scheme, is a Collection_of_class_of_facility.

The data associated with a Collection_of_class_of_facility are the following:

–   part;

–   whole.

4.2.48.1   part

The part specifies the Class_of_facility that is a member of the collected object.

4.2.48.2   whole

The whole specifies the Class_of_facility that is the collected object.

4.2.49 Collection_of_class_of_information_content

A Collection_of_class_of_information_content is an association between two Class_of_information_content objects (see 4.2.27) that indicates one part of the other, but does not play a particular role within it.

NOTE 1 – A collection of Class_of_information_content objects is itself a Class_of_information_content.

A Class_of_information_content that is a collection is a class library, or dictionary of classes, for Information_content objects.

EXAMPLE 80 – The association between the document classification scheme for J. Bloggs and Co. (a Class_of_Information_content) and the Class_of_information_content pump_data_sheet, that indicates pump_data_sheet is within the classification scheme, is a Collection_of_class_of_information_content.

The data associated with a Collection_of_class_of_information_content are the following:

– part;

– whole.

4.2.49.1 part

The part specifies the Class_of_information_content that is a member of the collected object.

4.2.49.2 whole

The whole specifies the Class_of_information_content that is the collected object.

4.2.50 Collection_of_class_of_material

A Collection_of_class_of_material is an association between two Class_of_material objects (see 4.2.30) that indicates one part of the other, but does not play a particular role within it.

NOTE 1 – A collection of Class_of_material objects is itself a Class_of_material.

A Class_of_material that is a collection is a class library, or dictionary of classes, for Material objects.

EXAMPLE 81 – The association between the material classification scheme for J. Bloggs and Co. (a Class_of_material) and the Class_of_material Reciprocating_positive_displacement_pump (see annex M, instance 815), that indicates Reciprocating_positive_displacement_pump is within the classification scheme, is a Collection_of_class_of_material.

The data associated with a Collection_of_class_of_material are the following:

– part;

– whole.

4.2.50.1 part

The part specifies the Class_of_material that is a member of the collected object.

4.2.50.2 whole

The whole specifies the Class_of_material that is the collected object.

4.2.51 Collection_of_class_of_property

A Collection_of_class_of_property is an association between two Class_of_property objects (see 4.2.31) that indicates one part of the other, but does not play a particular role within it.

> NOTE 1 – A collection of Class_of_property objects is itself a Class_of_property.

> A Class_of_property that is a collection is a class library, or dictionary of classes, for Properties.

> EXAMPLE 82 – The association between the Property classification scheme for J. Bloggs and Co. (a Class_of_property) and the Class_of_property Minimum_operating_NPSH that indicates Minimum_operating_NPSH is within the classification scheme, is a Collection_of_class_of_property.

The data associated with a Collection_of_class_of_property are the following:

- part;

- whole.

4.2.51.1 part

The part specifies the Class_of_property that is a member of the collected object.

4.2.51.2 whole

The whole specifies the Class_of_property that is the collected object.

4.2.52 Collection_of_composition_of_facility_into_hierarchy

A Collection_of_composition_of_facility_into_hierarchy is an association between a Hierarchy_of_composition_of_facility (see 4.2.92) and a Composition_of_facility (see 4.2.60) that indicates the Composition_of_facility is part of the hierarchy.

> EXAMPLE 83 – The association between:
>
> – the composition association between the water treatment system of Much Binding B and the Much Binding B power station (a Composition_of_facility); and
>
> – the set of composition associations that assembles each Facility into one and only one assembly for the purpose of identification (a Hierarchy_of_composition_of_facility),
>
> that indicates the composition association is part of the set, is a Collection_of_composition_of_facility_into_hierarchy.

The data associated with a Collection_of_composition_of_facility_into_hierarchy are the following:

– part;

– whole.

4.2.52.1 part

The part specifies the Composition_of_facility that is within the hierarchy.

4.2.52.2 whole

The whole specifies the Hierarchy_of_composition_of_facility that contains the Composition_of_facility.

4.2.53 Collection_of_composition_of_material_into_hierarchy

A Collection_of_composition_of_material_into_hierarchy is an association between a Hierarchy_of_composition_-of_material (see 4.2.93) and a Composition_of_material (see 4.2.62) that indicates the Composition_of_-material is part of the hierarchy.

EXAMPLE 84 – The association between:

– the composition association between weld MBB/XYZ/345B and the nozzle N335 in Much Binding B (a Composition_of_material); and

– the set of composition associations that ensures each weld is inspected once and only once along with an item on one side (a Hierarchy_of_composition_of_material),

that indicates the composition association is part of the set, is a Collection_of_composition_of_material_into_-hierarchy.

The data associated with a Collection_of_composition_of_material_into_hierarchy are the following:

– part;

– whole.

4.2.53.1 part

The part specifies the Composition_of_material that is within the hierarchy.

4.2.53.2 whole

The whole specifies the Hierarchy_of_composition_of_material that contains the Composition_of_material.

4.2.54 Collection_of_facility

A Collection_of_facility is a type of Composition_of_facility (see 4.2.60) that indicates the part does not have a particular role within the whole.

NOTES

1 – The association Possession_of_connector_by_facility is used to associate a Connector_of_facility with a Facility for which it is a connector, not the association Collection_of_facility.

EXAMPLE 85 – The association between the Piping_segment S2a in annex L the collection of Piping_segments for which detailed engineering design is to be carried out by J. Bloggs and Co., that indicates Piping_segment S2a is part of the collection, is a Collection_of_facility.

A collection may be of either specific Facilities or typical Facilities.

NOTE 2 – A collection of typical Facilities is itself a typical Facility.

A typical Facility that is a collection can be a catalogue of standard or reference Facilities.

EXAMPLE 86 – The association between the reference design for a distillate transfer system and the catalogue of reference Facility objects of J. Bloggs and Co., that indicates the reference design for a distillate transfer system is part of the catalogue, is a Collection_of_facility.

4.2.55   Collection_of_material

A Collection_of_material is a type of Composition_of_material (see 4.2.62) that indicates the part does not have a particular role within the whole.

EXAMPLE 87 – The association between the Material object that provides the service for pump P-4506-A in annex L and the set of pumps ordered from J. Bloggs and Co. (a Material object), that indicates the pump for P-4506-A is a part of the set, is a Collection_of_material.

A collection may be of either specific Material objects or typical Material objects.

NOTE 1 – A collection of typical Material objects is itself a typical Material.

A typical Material that is a collection can be a catalogue of standard or reference Material objects.

EXAMPLE 88 – The association between the pump model JBC/RP/12345 and the catalogue of standard pumps made by J. Bloggs and Co., that indicates the pump model is part of the catalogue, is a Collection_of_material.

4.2.56   Colour_rgb

A Colour_rgb is a type of Information_content (see 4.2.98) that describes a colour by proportions of red, green and blue light.

The data associated with a Colour_rbg are the following:

–   blue_proportion;

–   green_proportion;

–   red_proportion.

4.2.56.1 blue_proportion

The blue_proportion specifies the Numeric_value (see 4.2.112 that describes the level of intensity of blue light.

4.2.56.2 green_proportion

The green_proportion specifies the Numeric_value that describes the level of intensity of green light.

4.2.56.3 red_proportion

The red_proportion specifies the Numeric_value that describes the level of intensity of red light.

4.2.57 Composition_of_activity

A Composition_of_activity is an association between two Activity objects (see 4.2.7) that indicates one Activity is a part of the other Activity.

> EXAMPLE 89 – The association between the Activity - check the process data for the Much Binding distillate transfer system, and the Activity - check the process data for pump P-4506-A, that indicates one Activity is part of the other, is a Composition_of_activity.

> EXAMPLE 90 – The association between transfer_material Activity - flux of steam into the steam drum of Much Binding power station for operating case 1, and the transfer_material Activity - flux of steam and water into the steam drum of Much Binding power station for operating case 1, is a Composition_of_activity.

A Composition_of_activity is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Composition_of_activity shall associate actual Activity objects. An intended Composition_of_activity may associate either intended or actual Activity objects.

> NOTE 1 – The intent for an Activity can be recorded, which is intended to have both continuing actual Activity objects and other intended Activity objects as parts.

The data associated with a Composition_of_activity are the following:

– part;

– whole.

4.2.57.1 part

The part specifies the Activity that is the part of the whole.

4.2.57.2 whole

The whole specifies the Activity that contains the part.

> NOTE 1 – Two Activity application objects that are part of the same whole can happen concurrently or in sequence. The order of two Activity application objects that are in sequence is a Temporal_sequence_of_activity.

4.2.58 Composition_of_annotation_element

A Composition_of_annotation_element is an association between two Annotation_elements (see 4.2.12) that indicates one Annotation_element is a part of the other Annotation_element.

A Composition_of_annotation_element is either an Assembly_of_annotation_element (see 4.2.17) or a Collection_of_annotation_element (see 4.2.46).

The data associated with a Composition_of_annotation_element are the following:

– part;

– whole.

4.2.58.1 part

The part specifies the Annotation_element that is a part of the whole.

4.2.58.2 whole

The whole specifies the Annotation_element that contains the part.

4.2.59 Composition_of_data_record

A Composition_of_data_record is an association between two Data_records (see 4.2.71) that indicates one Data_record is a part of the other Data_record.

> NOTES
>
> 1 – A set of Data_records is itself a Data_record.
>
> 2 – A set of Data_records can be approved as a single item.
>
> EXAMPLE 91 – The association between:
>
> – the Data_record that records the shell side operating pressure of heat exchanger E-4507 in annex L; and
>
> – the Data_record that is the set of Data_records approved for issue by the process department,
>
> that indicates the shell side operating pressure Data_record is part of the set, is a Composition_of_data_record.

The data associated with a Composition_of_data_record are the following:

– part;

– whole.

4.2.59.1 part

The part specifies the Data_record that is a part of the whole.

4.2.59.2 whole

The whole specifies the Data_record that contains the part.

4.2.60 Composition_of_facility

A Composition_of_facility is an association between two Facility objects (see 4.2.89) that indicates one Facility is a part of the other Facility.

A Composition_of_facility is either an Assembly_of_facility (see 4.2.18) or a Collection_of_facility (see 4.2.54).

NOTE 1 – The association Possession_of_connector_by_facility is used to associate a Connector_of_facility with a Facility for which it is a connector, not the association Composition_of_facility.

A Composition_of_facility is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Composition_of_facility shall associate actual Facility objects. An intended Composition_of_-facility may associate either intended or actual Facility objects.

NOTE 2 – The intent for a Facility can be recorded, which is intended to have both existing actual Facility objects and other intended Facility objects as parts.

The data associated with a Composition_of_facility are the following:

– part;

– whole.

4.2.60.1 part

The part specifies the Facility that is a part of the whole.

4.2.60.2 whole

The whole specifies the Facility that contains the part.

4.2.61 Composition_of_information_content

A Composition_of_information_content is an association between two Information_contents (see 4.2.98) that indicates one Information_content is part of the other Information_content.

EXAMPLES

92 – The association between the process data sheet for valve V1a (an Information_content) and the process design book for the Much Binding refinery (another Information_content), that indicates the data sheet is part of the design book, is a Composition_of_information_content.

93 – The association between the structural integrity report on Vessel V-4506 and the safety case submission for operation of Much Binding B, that indicates the structural integrity report is part of the safety case submission, is a Composition_of_information_content.

> NOTE 1 – An Information_content can be a composition of two Numeric_values, that are upper and lower range bounds. The composite Information_content is then a range.

> EXAMPLE 94 – Greater that 15 bar gauge and less that 18 bar gauge is an Information_content. The association between the Numeric_value greater that 15 bar gauge and the range Information_content, that indicates 15 bar gauge is a lower bound of the range, is a Composition_of_information_content.

The data associated with a Composition_of_information_content are the following:

– part;

– whole.

4.2.61.1   part

The part specifies the Information_content that is a part of the whole.

4.2.61.2   whole

The whole specifies the Information_content that contains the part.

4.2.62   Composition_of_material

A Composition_of_material is an association between two Material objects (see 4.2.110) that indicates one Material object is a part of the other Material object.

A Composition_of_material is either an Assembly_of_material (see 4.2.19) or a Collection_of_material (see 4.2.55).

A Composition_of_material is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Composition_of_material shall associate actual Material objects. An intended Composition_of_material may associate either intended or actual Material objects.

> NOTE 1 – The intent for a Material object can be recorded, which is intended to have both existing actual Material objects and other intended Material objects as parts.

The data associated with a Composition_of_material are the following:

– part;

– whole.

4.2.62.1   part

The part specifies the Material object that is a part of the whole.

4.2.62.2   whole

The whole specifies the Material object that contains the part.

4.2.63 Composition_of_organization

A Composition_of_organization is an association between two Organizations (see 4.2.114) that indicates one Organization is a part of the other Organization.

EXAMPLES

95 – The association between J. Bloggs and Company Limited and the Piping Design Department of J. Bloggs and Co. is a Composition_of_organization.

96 – The association between the position - piping designer at J. Bloggs and Co., and the Organization - J. Bloggs and Co., that indicates the position is part of the Organization, is a Composition_of_organization.

The data associated with a Composition_of_organization are the following:

– part;

– whole.

4.2.63.1 part

The part specifies the Organization that is a part of the whole.

4.2.63.2 whole

The whole specifies the Organization that contains the part.

4.2.64 Connection_of_annotation_element

A Connection_of_annotation_element is an association between two Annotation_elements that indicates one is connected to the other.

NOTES

1 – A Connection_of_annotation_element is information about what the areas of colour, shading or texture are intended to convey.

If does not indicate that the areas of colour, shading or texture touch or overlap, nor does it indicate that objects presented by the Annotation_elements have a particular relationship.

2 – An application program can use the fact that Annotation_elements are connected to control drag operations on symbols. However the operation of such a program is not specified by this part of ISO 10303.

EXAMPLE 97 – The association between the symbol presenting valve V7 in the P&ID in annex L and the symbol presenting the inlet nozzle of vessel V-4506, that indicates the valve symbol is connected to the nozzle symbol, is a Connection_of_annotation_element.

These symbols are separated by an area without colour, shading or texture.

NOTE 3 – This part of ISO 10303 does not require that the connectivity of the Annotation_elements is consistent with the connectivity of the objects presented by them.

An application program can check that the connectivity of Annotation_elements is consistent with the connectivity of the objects, or can generate the connectivity of one from the other, but the operation of such a program is not specified by this part of ISO 10303.

The data associated with a Connection_of_Annotation_element are the following:

– side_1;

– side_2.

The choice of side_1 or side_2 for a connected Annotation_element is arbitrary, so that the same information is recorded whatever the choice.

4.2.64.1 side_1

The side_1 specifies one of the Annotation_elements that are connected.

4.2.64.2 side_2

The side_2 specifies the other Annotation_element that is connected.

4.2.65 Connection_of_facility

A Connection_of_facility is an association between two Facility objects (see 4.2.89) that indicates one is functionally connected to the other.

NOTES

1 – A connection can be made between two Facility objects with different classifications.

2 – A connection can be made to a Facility that is not a Connector_of_facility. This indicates a connection to the Facility but does not specify any particular connector.

Such a connection association is usually created at an early conceptual stage in the design process.

3 – If many Facility objects are connected together, then a Facility classified as a node is used. Each connected Facility has a single connection association with the node.

EXAMPLES

98 – The association between the inlet 1 of V-4506 (a Connector_of_facility) and Piping_segment S12 in annex L, that indicates the inlet is connected to the Piping_segment, is a Connection_of_facility.

99 – Piping branch 3, piping branch 4 and piping branch 5 in annex L are connected via piping joint 2 (a Facility classed as a node), as shown in figure 10.

There are three Connection_of_facility associations, as follows:

piping branch 5

piping branch 3   piping joint 2   piping branch 4
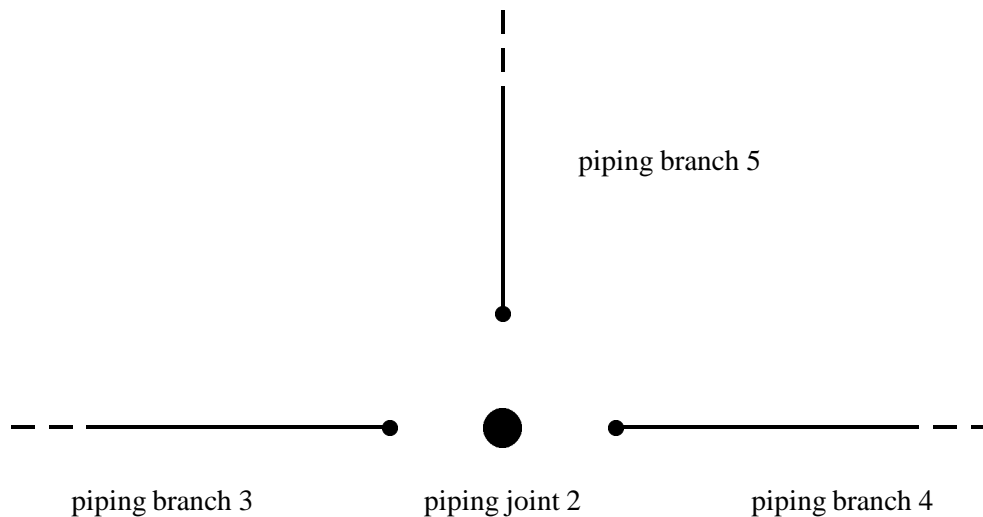
Figure 10 – The connection of three piping branches at a node

– between piping branch 3 and piping joint 2;

– between piping branch 4 and piping joint 2; and

– between piping branch 5 and piping joint 2.

A Connection_of_facility is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Connection_of_facility shall associate actual Facility objects. An intended Connection_of_-facility may associate either intended or actual Facility objects.

NOTE 4 – The intent for a connection can be recorded between:

– two Facility objects that both exist;

– a Facility that exists, and an intended Facility; and

– two intended Facility objects.

The data associated with a Connection_of_facility are the following:

– side_1;

– side_2.

The choice of side_1 or side_2 for a connected Facility is arbitrary, so that the same information is recorded whatever the choice.

4.2.65.1 side_1

The side_1 specifies one of the Facility objects that is connected.

4.2.65.2 side_2

The side_2 specifies the other Facility that is connected.

4.2.66 Connection_of_material

A Connection_of_material is an association between two Material objects (see 4.2.110) that indicates one is physically connected to the other.

NOTES

1 – In the real world a connection of Material objects usually requires a physical means such as bolts, a weld, or bonding. Sometimes Material objects placed on top of each other are held together by gravity.

No information about the physical means need be recorded, but if it is required it can be recorded by a Usage_of_material_in_connection (see 4.2.182).

2 – A connection can be made between two Material objects with different classifications.

EXAMPLES

100 – The association between the flange at the end of the nozzle for inlet 1 of V-4506 and the flange at the end of Piping_segment S12 in annex L, that indicates the two flanges are connected, is a Connection_of_-material.

101 – The association between the inlet nozzle for V-4506 and the pipe spool that provides the service for Piping_segment S12 in annex L, that indicates the nozzle is connected to the pipe spool, is a Connection_of_-material.

NOTE 3 – Examples 100 and 101 record information about the same connection in the real world, but at different levels of detail.

EXAMPLE 102 – The association between the inlet nozzle and the bare vessel that provide the service for V-4506 in annex L, that indicates the nozzle is connected to the vessel, is a Connection_of_material.

A Connection_of_material is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Connection_of_material shall associate actual Material objects. An intended Connection_of_-material may associate either intended or actual Material objects.

NOTE 4 – The intent for a connection can be recorded between:

   – two Material objects that both exist;

– a Material object that exists, and an intended Material object; and

– two intended Material objects.

The data associated with a Connection_of_material are the following:

– side_1;

– side_2.

The choice of side_1 or side_2 for a connected Material object is arbitrary, so that the same information is recorded whatever the choice.

4.2.66.1   side_1

The side_1 specifies one of the Material objects that is connected.

4.2.66.2   side_2

The side_2 specifies the other Material object that is connected.

4.2.67   Connector_feature_of_annotation_element

A Connector_feature_of_annotation_element is a type of Annotation_element (see 4.2.12) that is a part of another Annotation_element recognized as suitable for a connection.

A Connector_feature_of_annotation_element may be a point (with 0D topology), a curve (see 3.3) (with 1D topology), or a surface (see 3.3) (with 2D topology).

NOTE 1 – A Connector_feature_of_annotation_element is usually within, or on the boundary of, an Annotation_element, but need not be.

A Connector_feature_of_annotation_element with 1D topology is associated with a 2d_curve (see 4.2.2) by a Centre_line_for_annotation_curve (see 4.2.23).

A Connector_feature_of_annotation_element with 2D topology is associated with a 2d_curve (see 4.2.2) that is its outer boundary by a Outer_boundary_for_annotation_area (see 4.2.118) and with its inner boundaries by one or more Inner_boundary_for_annotation_area (see 4.2.118).

NOTES

2 – A Connector_feature_of_annotation_element is associated with its possessing Annotation_element by a Possession_of_connector_feature_by_annotation_element (see 4.2.131).

3 – A Connector_feature_of_annotation_element is usually placed with respect to its possessing Annotation_element by a Relative_placement_of_annotation_element (see 4.2.162.

In many cases a Connector_feature_of_annotation_element has a coordinate system that is identical to that of its possessing Annotation_element.

CONNECTOR FEATURE OF
ANNOTATION ELEMENT
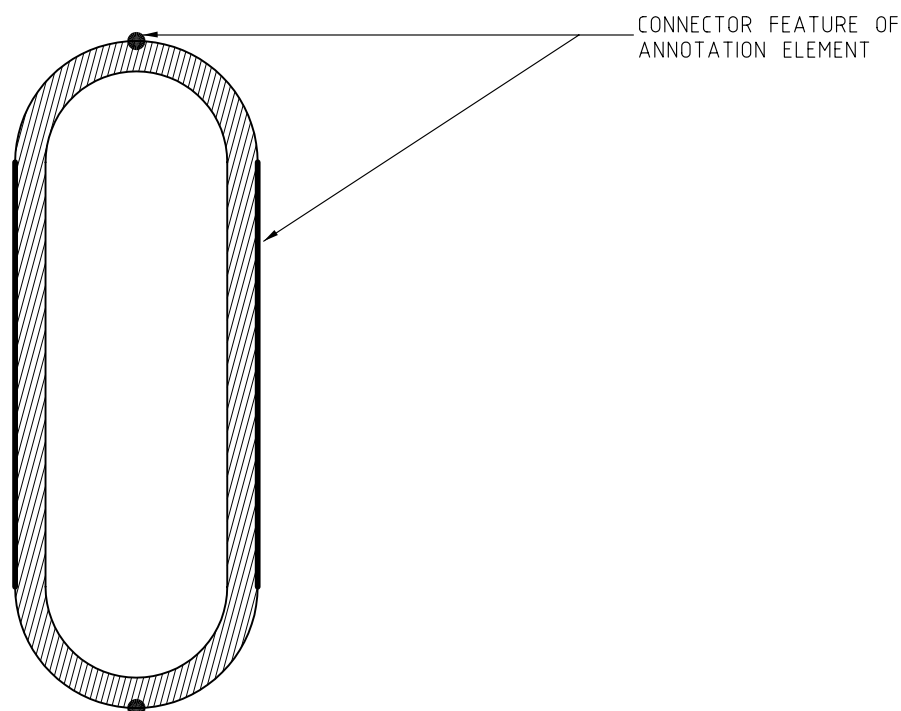
Figure 11 – A Connector_feature_of_annotation_element

EXAMPLE 103 – The shaded area in figure 11 is an Annotation_element that presents a Distillation_column (see annex M, instance 477) and that is larger than normal.

An Annotation_curve can be connected to the top and bottom points of the Annotation_element presenting the column and to the straight parts of its sides. The parts of the Annotation_element to which an Annotation_-curve can be connected are instances of Connector_feature_of_annotation_element.

4.2.68   Connector_of_facility

A Connector_of_facility is a type of Facility (see 4.2.89) that enables a flow of energy, load, process material or signal to or from another Facility.

NOTES

1 – A single Connector_of_facility is a service that can be provided by an assembly that involves many Material objects and connections between them.

2 – A single Material object that is a manifold, can enable several distinct flows of process material, and hence provide a service that is several Connectors_of_facility.

3 – A single Material object that is an electrical connector, can enable several distinct flows of electric current, and hence provide a service that is several Connectors_of_facility.

EXAMPLE 104 – Inlet 1 of reflux vessel V-4506 in annex L is a Connector_of_facility.

4.2.69 Control_of_information_content_by_organization

A Control_of_information_content_by_organization is an association between an Organization (see 4.2.114) and an Information_content (se 4.2.98) that indicates the Organization has the right to distribute and to revise the Information_content.

EXAMPLE 105 – Association between the Organization ISO and the Informationcontent that is the Text of the document called "ISO 10303 part 221", is a Control_of_information_content_by_organization. ISO has the right to distribute the Text on a Physical_information_carriers, and to revise the Text.

The data associated with a Control_of_information_content_by_organization are the following:

– controlled;

– controller.

4.2.69.1 controlled

The controlled specifies the Information_content that the Organization has a right to distribute and revise.

4.2.69.2 controller

The controller specifies the Organization that has the right to distribute and to revise the Information_-content.

4.2.70 Custody_of_material_by_organization

A Custody_of_material_by_organization is an association between a Material object (see 4.2.110) and an Organization (see 4.2.114) that indicates the Organization controls or is responsible for the control of the Material object.

EXAMPLE 106 – The association between the Organization J. Bloggs Transport Ltd and the Material object "Much Binding refinery column XYZ" whilst it is being moved from the fabricator to the site is a Custody_-of_material_by_organization.

The data associated with a Custody_of_material_by_organization are the following:

– custodian;

– held.

4.2.70.1 custodian

The custodian specifies the Organization that has custody of the material

4.2.70.2   held

The held specifies the Material that the Organization controls or has the responsibility to control.

4.2.71   Data_record

A Data_record is a record held by a data management system that records the existence of one or more application objects within this part of ISO 10303.

A set of Data_records is itself a Data_record.

The attributes and associations of a Data_record convey information about that Data_record. They do not convey information about the application object or objects that it records.

> EXAMPLE 107 – The record of the existence of the intended Facility that is pump P-4506-A in annex L in a data base is a Data_record.
>
> The association between the Data_record and the Point_in_time 10:45 on 14th February 1996 is a Beginning_-effect that indicates the Data_record was created at the Point_in_time.
>
> The intended Facility can have existed before the Beginning_effect of its Data_record - perhaps as hand written notes on paper.

The data associated with a Data_record are the following:

– identifier;

– subject.

4.2.71.1   identifier

An identifier specifies the text string that identifies the Data_record.

4.2.71.2   subject

A subject specifies the application_object that is recorded by the Data_record.

Each application object may be recorded by a data record.

> NOTE 1 – The application objects that can be recorded are presented in the ARM diagrams by the SELECT TYPE Recorded_object.

A subject need not be specified for a Data_record.

4.2.72   Date_and_time

A Date_and_time is a type of Information_content (see 4.2.98) that is a calendar date and a clock time.

> NOTE 1 – A Date_and_time can describe a Point_in_time.

> EXAMPLE 108 – The 06:00 GMT on 7th of May 1949 is a Date_and_time.

4.2.73   Definition_of_object_by_information_content

A Definition_of_object_by_information_content is a type of Description_of_object_by_information_content (see 4.2.79) that indicates the Information_content (see 4.2.98) is expected to be a principal source of understanding about the nature of the described object.

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109 – The association between the Connection_of_material that joins the Material object that is vessel V-4506 in annex L to its inlet nozzle and the Information_content "class 1 weld", that indicates the Information_content defines the Connection_of_material, is a Definition_of_object_by_information_content.

110 – The association between the Facility heat exchanger E-4507 in annex L and the Information_content that is its process specification, is a Definition_of_object_by_information_content.

NOTE 1 – The example 110 is equivalent to example 134 but shown a different working practice. Example 134 is a document based practice, in which Information_content is managed as documents. Example 110 is an information based practice in which Information_content is managed directly as Text, bit mapped images, etc..

4.2.74   Definition_of_object_via_information_carrier

A Definition_of_object_via_information_carrier is a type of Description_of_object_via_information_carrier (see 4.2.80) that indicates the information holder contains Information_content that is expected to be a principal source of understanding about the nature of the described object.

EXAMPLE 111 – The association between the Facility heat exchanger E-4507 in annex L and the document JBC/HEX/123 containing a process specification, that indicates the document is a definition of the heat exchanger, is a Definition_of_object_via_information_carrier.

4.2.75   Derivation_of_annotation_element

A Derivation_of_annotation_element is an association between one Annotation_element (see 4.2.12) and another, that indicates one is a derivative of the other.

One Annotation_element is a derivative of another if it has been obtained from the other by a process.

A Derivation_of_annotation_element is either a Hatching_derivation_for_annotation_element (see 4.2.91), Tiling_derivation_for_annotation_element (see 4.2.174), View_derivation_for_annotation_element (see 4.2.187).

The following information about a source Annotation_element is also information about the derived Annotation_element, unless explicitly changed:

 – physical dimensions of the two dimensional planar surface of colour, shape or texture;

 – the colour, shape and texture.

There is no coordinate shift between the source and the derived Annotation_elements. Hence a point in the source Annotation_element described by co-ordinates $(0,0)$ is mapped to the point in the derived Annotation_element with the same co-ordinates.

The source and derived Annotation_elements are the same size, unless a scaling is specified by a Scaling_-for_derivation (see 4.2.167).

NOTES

1 – An Annotation_element that is the source for a derivation can be a reference Annotation_element that need not be:

- displayed on a Physical_information_carrier; or

- placed relative to another Annotation_element.

2 – The shape of an Annotation_text is specified by the Text with which it is associated by a Presentation_-of_object_by_annotation_element.

An Annotation_element derived from an Annotation_text has the same shape, but is not associated with the Text, unless this is explicitly stated.

3 – An Annotation_element can be an assembly defined by Assembly_of_annotation_element and Relative_-placement_of_annotation_element associations.

An Annotation_element derived from an Annotation_element that is an assembly has the same shape, and colour, shading or texture, but does not have parts unless this is explicitly stated.

4 – The shape of a derived Annotation_element can be derived from the shape of a source Annotation_-element by a scaling (see 4.2.167).

The data associated with a Derivation_of_annotation_element are the following:

- derivative;

- source.

4.2.75.1   derivative

The derivative specifies the Annotation_element that is obtained from the source by a process.

4.2.75.2   source

The source specifies the Annotation_element from which the derived Annotation_element is obtained.

4.2.76   Derivative_association_between_objects

A Derivative_association_between_objects is an association between one object and another that indicates one is a derivative of the other.

One object is a derivative of another if it has been obtained from the other, but is not intended to replace the other.

A derivative association between Intended_objects (see 4.2.101) or Typical_objects (see 4.2.178) indicates that the derivative object has been obtained by a Design (see annex M, instance 2) Activity from the the source object.

NOTES

1 – The Design Activity that creates one intended or Typical_object as a derivative of another can be merely a copy of the design data with change of identification.

2 – If two objects have a Derivative_association_between_objects between them, then usually there are few other objects associated with both.

If a source object has components, then usually a derivative object has different components that are each separately derived from the source object components.

Two objects with a Derivative_association_between_objects between them do not have a component in common, unless it is intended that the component shall be simultaneously part of both.

3 – A Derivative_association_between_objects can be between two Typical_objects, two Specific_objects or between a Typical_object and a Specific_object.

4 – A Typical_object is often held in a collection of other Typical_objects classified as a Facility_catalogue (see annex M, instance 35) or as a Material_catalogue (see annex M, instance 545).

A Typical_object can be presented to a person by a Physical_information_carrier that is called a 'catalogue'.

A Derivative_association_between_objects for which the source object is a Typical_object and the derivative object is Specific_object, indicates that the Specific_object is a usage of the reference or catalogue object.

NOTES

5 – A design often contains Material objects that are intended and specific and that have be derived from standard parts in a catalogue.

6 – The definition of a master document, perhaps held in electronic form, is a typical Material object. Individual copies of the document, which can have a controlled circulation, are specific Material objects.

Each specific Material object is associated with the typical Material object by a Derivative_association_between_objects.

A Derivative_association_between_objects for which the source is a Specific_object and the derivative is a Typical_object, indicates that the Typical_object is a reference design that has been created from information about the Specific_object.

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112 – The association between the intended is specific Material object that provides the service for P-4506-A in annex L and the typical Material object that is J. Bloggs and Co. pump model XYZ1234 is a Derivative_association_between_objects.

113 – The association between the actual specific Material object that is a numbered copy of the Much Binding B power station Safety Case and the typical Material object that is the document with reference "MBB/SCR/12345" is a Derivative_association_between_objects.

The association between the document with reference "MBB/SCR/12345" and the Text:

$$\text{"}\backslash\texttt{begin\{document\}} \ \texttt{.......} \ \backslash\texttt{end\{document\}"}$$

that is its LaTeX source, is a Definition_of_object_by_information_content.

The association between the document with reference "MBB/SCR/12345" and the actual specific Facility that is the file mbb_scr_12345.tex containing its LaTeX source, is a Definition_of_object_by_information_carrier.

114 – The association between the intended Facility Ulan Bator A and the intended Facility Much Binding B, that indicates Ulan Bator A was created by adapting the design of Much Binding B, is a Derivative_association_between_objects.

115 – The association between the Numeric_value that is 400 degrees C and the Text "400 degrees Centigrade", that indicates the source information is the Numeric_value, is a Derivative_association_between_objects.

116 – The association between the Text "Status: preliminary" and the Text "Statut: préliminaire", that indicates the source information is the English text, is a Derivative_association_between_objects.

NOTES

7 – A Derivative_association_between_objects can indicate that one Property is derived from the other. This can be either because of a dependence in the real world or because of a design dependence.

If the value for a Property that has dependent properties is changed, then an application program can warn the user about the other Property objects derived from it, but the operation of such a program is not specified by this part of ISO 10303.

8 – Two Property objects that have a Derivative_association_between_objects between them need not have the same Numeric_value.

EXAMPLE 117 – The association between the intended operating pressure of valve 45-FCV-501 in annex L and the intended operating pressure of the outlet of pump P-4506-A, that indicates the valve operating pressure is derived from the pump outlet operating pressure is a Derivative_association_between_objects.

The data associated with a Derivative_association_between_objects are the following:

– derivative;

– source.

4.2.76.1   derivative

The derivative specifies the object that is obtained from the source by a process.

Each application object may be the derivative of a Derivative_association_between_objects.

NOTE 1 – The application objects that can be the derivative are presented in the ARM diagrams by the SELECT TYPE Controlled_object.

4.2.76.2   source

The source specifies the object that is used to produce the derivative by a process.

Each application object may be the source of a Derivative_association_between_objects.

NOTE 1 – The application objects that can be the source are presented in the ARM diagrams by the SELECT TYPE Controlled_object.

4.2.77   Description_of_display_by_placement

A Description_of_display_by_placement is an association between a Display_of_annotation_element_on_-physical_information_carrier (see 4.2.85) and a 2d_placement (see 4.2.4) that indicates the relationship between the coordinate system for the displayed Annotation_element (see 4.2.12) and the coordinate system for the Physical_information_carrier (see 4.2.124) is described by the 2d_placement.

The origin of the coordinate system for a Drawing_sheet (see annex M, instance 1215) is at the bottom left hand corner. If the Drawing_sheet is a Landscape_format_document (see annex M, instance 1216) then the x coordinate axis is the long dimension. If the Drawing_sheet is Portrait_format_document (see annex M, instance 1217) then the x coordinate axis is the short dimension.

EXAMPLE 118 – The shaded area in figure 12 is a presentation of a Landscape_format_document (see annex M, instance 1216) that has coordinate axes denoted x and y.

The black lines within the shaded area are an Annotation_element that presents a P&ID and that has coordinate axes denoted x' and y'.

The Annotation_element is placed relative to the Physical_information_carrier.

The data associated with a Description_of_display_by_placement are the following:

– described;

– describing.

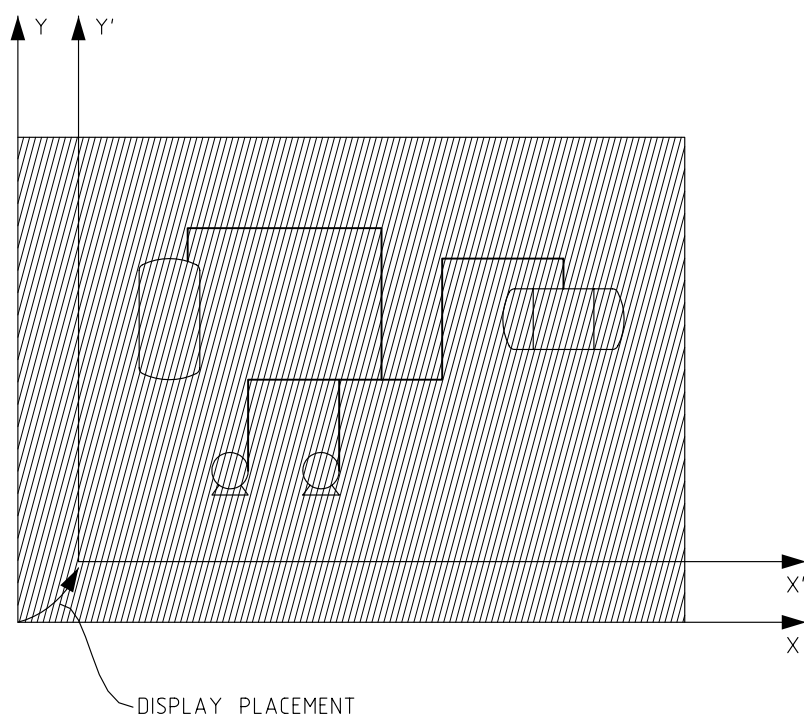## 4.2.77.1   described

The described specifies the Display_of_annotation_element_on_physical_information_carrier that has the description.

4.2.77.2   describing

The describing specifies the 2d_placement that describes the Display_of_annotation_element_on_physical_-information_carrier.

Figure 12 – An Annotation_element placed on a Physical_information_carrier

4.2.78 Description_of_hatching_by_pitch

A Description_of_hatching_by_pitch is an association between a Hatching_derivation_for_annotation_-
element (see 4.2.91) and a 2d_vector (see 4.2.6) that indicates the hatching pattern created by the Hatch-
ing_derivation_of_annotation_element is described by the 2d_vector.

The 2d_vector describes the direction that is normal to the Annotation_curves (see 4.2.11) in the hatching
pattern.

The magnitude of the 2d_vector describes the distance between the centre lines of adjacent Annotation_-
curves in the direction of the normal.

The coordinate system of the derived Annotation_element is the placement coordinate system (see 3.3)
of the 2d_vector.

The data associated with a Description_of_hatching_by_pitch are the following:

– described;

– describing.

4.2.78.1 described

The described specifies the Hatching_derivation_of_annotation_element that has the pitch.

4.2.78.2 describing

The describing specifies the 2d_vector that describes the pitch of the hatching.

4.2.79 Description_of_object_by_information_content

A Description_of_object_by_information_content is an association between an object and an Informa-
tion_content (see 4.2.98) that indicates the Information_content is about the object.

The Information_content describes, defines or makes reference to the object.

A Description_of_object_by_information_content may be either a Definition_of_object_by_information_-
content (see 4.2.73), a Reference_to_object_by_information_content (see 4.2.160), or an Identification_-
of_object_by_information_content (see 4.2.96).

> EXAMPLE 119 – The association between the Person Fred Bloggs and the Informationcontent "He is au-
> thorised to approve designs of safety critical systems", that indicates the Information_content is a description
> of the Person, is a Description_of_object_by_information_content.

The data associated with a Description_of_object_by_information_content are the following:

– described;

– describing.

4.2.79.1 described

The described specifies the application object that is described by the Information_content.

The application objects that may be described are as follows:

– Activity;

– Approval_of_object;

– Beginning_or_end_effect;

– Class_of_activity;

– Class_of_annotation_element;

– Class_of_facility;

– Class_of_information_content;

– Class_of_involvement;

– Class_of_material;

– Class_of_property;

– Connection_of_facility;

– Connection_of_material;

– Facility;

– Feature;

– Hierarchy_of_composition_of_facility;

– Hierarchy_of_composition_of_material;

– Information_content;

– Material;

– Organization;

– Orientation;

– Person;

– Point_in_space;

– Point_in_time;

– Property;

– Provision_of_service_by_resource.

> NOTE 1 – The different application objects that can be described are presented in the ARM diagrams by the SELECT TYPE Described_object.

4.2.79.2   describing

The describing specifies the Information_content that describes the object.

4.2.80   Description_of_object_via_information_carrier

A Description_of_object_via_information_carrier is an association between an object and an information holder that indicates the Information_content (see 4.2.98) held by the information holder is about the object.

The Information_content describes, defines or makes reference to the object.

A Description_of_object_via_information_carrier may be either a Definition_of_object_via_information_-carrier (see 4.2.74), or a Reference_to_object_via_information_carrier (see 4.2.161).

> EXAMPLE 120 – The association between the Person Fred Bloggs and personnel file (document JBC/PD/1234), that indicates the personnel file is about Fred Bloggs, is a Description_of_object_via_information_carrier.

The data associated with a Description_of_object_via_information_carrier are the following:

– described;

– describing.

4.2.80.1   described

The described specifies the application object that is described by the Information_carrier.

The application objects that may be described are as follows:

– Activity;

– Approval_of_object;

– Beginning_or_end_effect;

– Class_of_activity;

– Class_of_annotation_element;

- Class_of_facility;

- Class_of_information_content;

- Class_of_involvement;

- Class_of_material;

- Class_of_property;

- Connection_of_facility;

- Connection_of_material;

- Facility;

- Feature;

- Hierarchy_of_composition_of_facility;

- Hierarchy_of_composition_of_material;

- Information_content;

- Material;

- Organization;

- Orientation;

- Person;

- Point_in_space;

- Point_in_time;

- Property;

- Provision_of_service_by_resource.

  NOTES

  1 – The different application objects that can be described are presented in the ARM diagrams by the SE-LECT TYPE Described_object.

  2 – The list of application objects given here is identical to that given in 4.2.79.1.

4.2.80.2 describing

The describing specifies the information holder, either a Logical_information_carrier (see 4.2.108) or a Physical_information_content (see 4.2.108), that holds the description of the object.

> NOTE 1 – The different application objects that can be an information holder are presented in the ARM diagrams by the SELECT TYPE Holder.

4.2.81 Description_of_point_in_time_by_date_and_time

A Description_of_point_in_time_by_date_and_time is a type of Definition_of_object_by_information_content (see 4.2.73) that associates a Point_in_time (see 4.2.128) with a Date_and_time (see 4.2.72) to describes the Point_in_time with respect to a clock and a calendar.

The data associated with a Description_of_point_in_time_by_date_and_time are the following:

– described;

– describing.

4.2.81.1 described

The described specifies the Point_in_time that has the Date_and_time.

4.2.81.2 describing

The describing specifies the Date_and_time that is a description of the Point_in_time.

4.2.82 Description_of_relative_placement

A Description_of_relative_placement is an association between a Relative_placement_of_annotation_element (see 4.2.162) and a 2d_placement (see 4.2.4) that indicates the coordinate system for shape representation of the placed Annotation_element (see 4.2.12) is related to the coordinate system for shape representation of the referenced Annotation_element by the 2d_placement.

The data associated with a Description_of_relative_placement are the following:

– described;

– describing.

4.2.82.1 described

The described specifies the Relative_placement_of_annotation_element that has the description.

4.2.82.2 describing

The describing specifies the 2d_placement that describes the Relative_placement_of_annotation_element.

4.2.83 Description_of_tiling_by_pattern

A Description_of_tiling_by_pattern is an association between a Tiling_derivation_of_annotation_element (see 4.2.174) and a Tiling_pattern (see 4.2.175) that indicates the tiling pattern created by the Tiling_-derivation_of_annotation_element is described by the Tiling_pattern.

The coordinate system of the derived Annotation_element is the placement coordinate system (see 3.3) of the repeat vectors for the Tiling_pattern.

The data associated with a Description_of_tiling_by_pattern are the following:

– described;

– describing.

4.2.83.1 described

The described specifies the Tiling_derivation_of_annotation_element that has the pattern.

4.2.83.2 describing

The describing specifies the Tiling_pattern that describes the Tiling_derivation_of_annotation_element.

4.2.84 Direction_range_for_connector_feature

A Direction_range_for_connector_feature is an association between a Connector_feature_of_annotation_-element (see 4.2.67) and a 2d_direction_range (see 4.2.3) that indicates the direction of the center line of an Annotation_curve connected to the Connector_feature_of_annotation_element shall be in the range.

The coordinate system of the Connector_feature_of_annotation_element is the placement coordinate system (see 3.3) for the 2d_direction_range. The angles in the range are expressed with respect to to the x axis of the placement coordinate system.

The direction of the centre line of the Annotation_curve shall be taken with a sense pointing away from the Connector_feature_of_annotation_element.

> NOTE 1 – The topologic sense (see 3.3) of the centre line for the Annotation_curve does not effect the direction of the centre line defined above.

> EXAMPLE 121 – The shaded area in figure 13 is an Annotation_element that presents a Distillation_column (see annex M, instance 477) and that is larger than normal.

> An Annotation_curve can be connected to the top and bottom points of the Annotation_element presenting the column and to the straight parts of its sides. The parts of the Annotation_element to which an Annotation_-curve can be connected are instances of Connector_feature_of_annotation_element (see 4.2.67).

> The range of valid directions for the centre line of an Annotation_curve connected to the Annotation_element are shown in the figure.

The data associated with a Direction_range_for_connector_feature are the following:
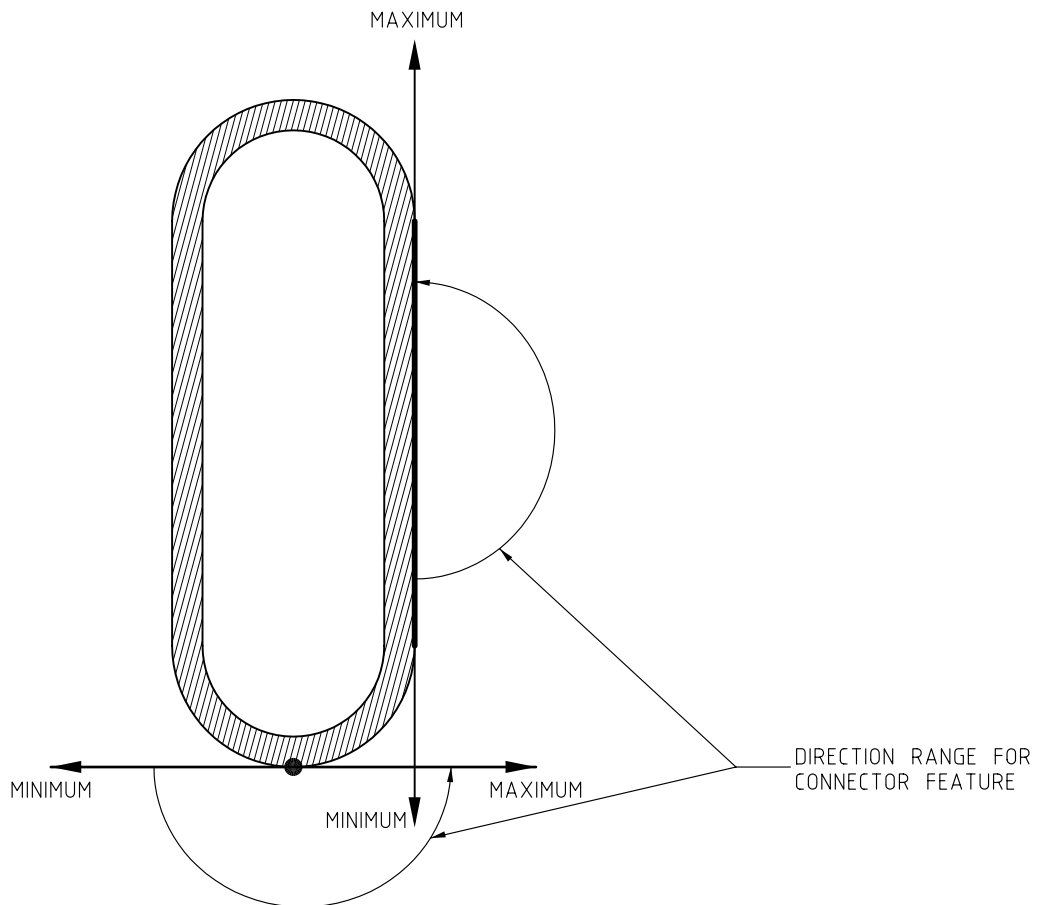
– described;

Figure 13 – A Direction_range_for_connector_feature

– describing.

4.2.84.1 described

The described specifies the Connector_feature_of_annotation_element that has the 2d_direction_range.

4.2.84.2 describing

The describing specifies the 2d_direction_range that describes the Connector_feature_of_annotation_element.

4.2.85 Display_of_annotation_element_on_physical_information_carrier

A Display_of_annotation_element_on_physical_information_carrier is an association between an Annotation_element (see 4.2.12) and a Physical_information_carrier (see 4.2.124) that indicates the Annotation_element is displayed as part of the Physical_information_carrier.

NOTES

1 – The Physical_information_carrier can be a drawing sheet (see 4.2.30).

2 – The placement of an Annotation_element on a displayer Physical_information_carrier is specified by a Description_of_display_by_placement (see 4.2.77).

The data associated with a Display_of_annotation_element_on_physical_information_carrier are the following:

– displayed;

– displayer.

4.2.85.1 displayed

The class specifies the Annotation_element that displayed as part of the displayer.

4.2.85.2 displayer

The displayer specifies the Physical_information_carrier that displayes the Annotation_element.

4.2.86 End_effect

An End_effect is a type of Beginning_or_end_effect (see 4.2.21) that is the end of an application object.

NOTE 1 – A change to the world is recorded by the beginning or end of an application object.

EXAMPLE 122 – The intended Facility, that is valve V1a in annex L, has an intended operating pressure of 15 bar. If the intended operating pressure is changed to 16 bar, then:

– the association between the valve and the Property that is the operating pressure of 15 bar ends; and

– the association between the valve and the Property that is the operating pressure of 16 bar begins.

The end of the association Possession_of_property_by_object between the valve V1a and the Property that is the operating pressure of 15 bar is an End_effect.

NOTE 2 – An End_effect is for an object and not for the Data_record that stands for an object.

EXAMPLE 123 – The End_effect for the actual Material vessel that is the resource for Facility V-4506 in annex L has a Point_in_time within the decommissioning process. (Exactly when during the decommissioning process from installed equipment to recycled steel scrap, the vessel is deemed to cease to exist is a business decision, that is not prescribed by this part of ISO 10303.)

The Data_record that stands for the actual Material vessel can, and usually does, continue to exist after the End_effect for the vessel.

4.2.87   Enumerated_property_in_class_of_property

An Enumerated_property_in_class_of_property is an association between a Property (see 4.2.137) and a Class_of_property (see 4.2.31) that indicates a Property is recognized to be a valid member of the class.

NOTES

1 – This association is intended to be used if the Class_of_property has only a finite number of possible members.

2 – An Enumerated_property_in_class_of_property is information about the real world. The existence of an enumerated set of Property objects for a class does not ensure that only Property objects within the set are so classified.

An application program can check for Property objects that are classified as being a member of a class, but that are not within the enumerated set of properties for that class. The operation of such a program is not specified by this part of ISO 10303.

EXAMPLE 124 – The association between the Property failure_to_open and the Class_of_property position_at_failure is an Enumerated_property_in_class_of_property.

Another enumerated Property for the class is failure_to_close.

NOTE 3 – Standard instances of Enumerated_property_in_class_of_property are defined by this part of ISO 10303. Further instances can be defined by a user.

The standard instances of Enumerated_property_in_class_of_property are defined in M.9.

The data associated with an Enumerated_property_in_class_of_property are the following:

– class;

– member.

4.2.87.1   class

The class specifies the Class_of_property that classifies the enumerated Property.

4.2.87.2 member

The member specifies the Property that is enumerated as being in the set classified by the Class‿of‿property.

4.2.88 Exclusion‿of‿association‿from‿inheritance

An Exclusion‿of‿association‿from‿inheritance is an association between an Inheritance‿of‿valid‿associations (see 4.2.99) and an object that indicates the object is not within the relevant data for the recipient of the data inheritance.

> NOTES
>
> 1 – The term 'data context object' is defined in 3.5.9 and the term relevant data is defined in 3.5.27.
>
> 2 – The operation of Exclusion‿of‿associations‿from‿inheritance is described by the data inheritance rules in 4.2.99.
>
> EXAMPLE 125 – Consider example 145 in 4.2.99.
>
> The following data is excluded from the data inheritance:
>
> – the Identification‿of‿object‿by‿information‿content association between the source Facility and the Text "rev 0"; and
>
> – the Possession‿of‿property‿by‿object association between the steam system (a Facility) and the output of 3000kW (a Property).
>
> The association between:
>
> – the Inheritance‿of‿valid‿associations association between the source and recipient Facility objects; and
>
> – the Identification‿of‿object‿by‿information‿content association between the source Facility and the Text "rev 0",
>
> that indicates the Identification‿of‿object‿by‿information‿content is excluded from the data inheritance, is an Exclusion‿of‿association‿from‿inheritance.
>
> The association between:
>
> – the Inheritance‿of‿valid‿associations association between the source and recipient Facility objects; and
>
> – the Possession‿of‿property‿by‿object association between the steam system Facility and the Property that is an output of 3000kW,
>
> that indicates the Possession‿of‿property‿by‿object is excluded from the data inheritance, is another Exclusion‿of‿association‿from‿inheritance.

The data associated with a Exclusion‿of‿association‿from‿inheritance are the following:

– excluded;

– inheritance.

4.2.88.1 excluded

The excluded specifies the object that is within the relevant data for the source but that does not participate in the data inheritance.

Each application object may be excluded from a data inheritance by an Exclusion_of_association_from_inheritance.

> NOTE 1 – The application objects that can be excluded are presented in the ARM diagrams by the SELECT TYPE Inheritable_object.

4.2.88.2 inheritance

The inheritance specifies the Inheritance_of_valid_associations that the object is excluded from.

4.2.89 Facility

A Facility is a type of Typical_or_specific_object (see 4.2.177) that is an ability to perform one or more Activities (see 4.2.7) relevant to the operation of a process plant.

A Facility is, or is intended to be, a service provided by one or more Material objects (see 4.2.110).

A Facility is a functional view of the Material objects that provide the service.

> NOTES
>
> 1 – A Facility can be associated with one or more Activity objects that it performs or is intended to perform.
>
> In the real world, an actual Facility performs one or more Activity objects (being 'on standby' is an Activity), but a record of these Activity objects need not be held.
>
> In the real world, an intended Facility is intended to perform one or more intended Activity objects, but a record of these Activity objects need not be held.
>
> 2 – A Facility can be associated with one or more Material objects that provide the service.
>
> In the real world, an actual Facility does not exist unless there are one or more actual Material objects that perform it, but a record of these Material objects need not be held.
>
> In the real world, the existence of an intended Facility implies that it is intended to be performed by one or more Material objects, but a record of these Material objects need not be held. During the design of a process plant, an intended Facility can be defined before the intended Material objects.
>
> 3 – Activity objects classed as process design, commissioning, operation and decommissioning are largely concerned with Facility objects.
>
> 4 – A Facility is commonly identified by a tag. A tag remains unchanged when different Material objects (equipment items or components) are installed to provide the service.

EXAMPLE 126 – In annex L, the heat exchanger with tag E-4507 is an intended Facility. Process information about the intended duty of the heat exchanger and its functional connectivity is recorded by associations with the intended Facility.

A specific physical component is designed or selected to perform the service with tag E-4507. This is the intended Material designated E-4507-prop3.

The shell and tube heat exchanger manufactured by J. Bloggs and Co. and delivered to the Much Binding refinery to be installed as E-4507, is an actual Material object. Information about the delivered shell and tube heat exchanger that is obtained by measurement is recorded by associations with the actual Material object.

Once the delivered shell and tube heat exchanger has been installed and is able to operate and cool distillate, there is an actual Facility designated E-4507. Information about the actual duty of the heat exchanger is recorded by associations with the actual Facility.

Exactly when during the installation and commissioning process the actual Facility is deemed to come into existence is a business decision, that is not prescribed by this part of ISO 10303.

A Facility is either a Specific_object (see 4.2.168) or a Typical_object (see 4.2.178).

A Facility that is a Specific_object has at some time, is intended to have at some time, a real world existence.

NOTES

5 – A specific Facility can be derived by reference to a typical Facility.

6 – A specific Facility can be either intended or actual.

EXAMPLES

127 – The pumps P-4506-A and P-4506-B in annex L are both intended specific Facilities.

128 – The distillate transfer system in annex L is an intended specific Facility.

A Facility that is also a Typical_object is a generic, parametric or a reference concept.

NOTES

7 – A typical Facility is a reference object from which an intended, and ultimately an actual, specific Facility can be derived.

8 – A collection of typical Facility objects is itself a typical Facility.

A typical Facility that is a collection can be a catalogue of standard or reference Facility objects.

9 – A typical Facility can be a reference design of a complete unit, perhaps large and complex. This design is reused, and modified as appropriate, whenever a corresponding specific Facility is required.

10 – A typical Facility can be a reference capability that a designer can select in the creation of a P&ID. In this case, a typical Facility is usually small and simple - perhaps a control valve or a check valve.

A menu of an intelligent P&ID system shows typical Facilities that can be selected to create a design.

EXAMPLE 129 – The reference design for a distillate transfer system held by J. Bloggs and Co., and used whenever the design of a Facility of that type is required, is a typical Facility.

4.2.90 Feature

A Feature is all or part of the surface of a Material object.

NOTES

1 – A Feature is usually recorded if it is a part of the surface that plays a role in a Connection_of_material.

2 – A Feature has a shape, but the shape of a Feature is not within the scope of this part of ISO 10303. The identification, description, properties and usage of a Feature are within the scope of this part of ISO 10303.

EXAMPLE 130 – The face of the flange to the inlet nozzle of vessel V-4506 in annex L that bears upon the gasket, is a Feature.

Surface finish properties for this Feature are recorded.

4.2.91 Hatching_derivation_for_annotation_element

A Hatching_derivation_for_annotation_element is a type of Derivation_of_annotation_element (see 4.2.75) that indicates the derived Annotation_element (see 4.2.12) is a hatching pattern created by replicating the source Annotation_curve.

A hatching pattern is a regularly spaced array of parallel Annotation_curves that are assumed to be infinite in length.

The hatching pattern is clipped at the boundary of the derived Annotation_element. A Hatching_-derivation_for_annotation_element does not indicate the shape of the derived Annotation_element.

The shape of the derived Annotation_element is specified exactly as if it were a uniform area of colour.

A Scaling_for_derivation (see 4.2.167) associated with Tiling_derivation_for_annotation_element determines the size of the replicas of the source Annotation_curve in the hatching pattern.

NOTES

1 – The spacing and orientation for the replicas of a source Annotation_curve is described by a 2d_vector (see 4.2.6). A 2d_vector that describes the spacing and orientation is associated with a Hatching_derivation_-for_annotation_element by a Description_of_hatching_by_pitch (see 4.2.78).

2 – The source Annotation_element is often classed as a Hatching_template (see annex M, instance 7).

EXAMPLE 131 – The shaded areas in figure 14 are a single rectangular Annotation_area with a hatching pattern. The Annotation_area is larger than normal, and the magnitudes of the pitch of the hatching is larger than normal compared to the size of the Annotation_area.

The outer boundary of the Annotation_area is shown as a dashed line.

The pitch that specifies the orientation and separation of the hatching is shown in the figure.
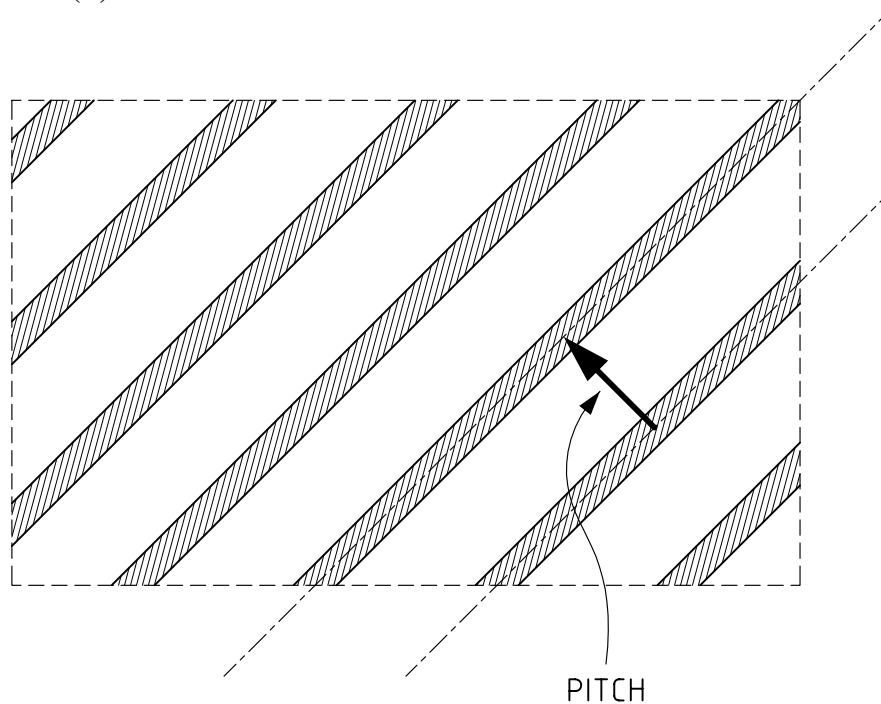
Figure 14 – An Annotation_area hatching pattern

4.2.92   Hierarchy_of_composition_of_facility

A Hierarchy_of_composition_of_facility is a set of Composition_of_facility associations (see 4.2.60) that is a decomposition hierarchy.

A Hierarchy_of_composition_of_facility is a set of composition associations such that no Facility is referenced as a part more than once.

EXAMPLE 132 – The set of assembly associations that defines a decomposition of Much Binding B, such that each Facility has a single unique identifier that is a concatenation of:

– the identifier of the assembly of which it is directly a part; and

– an identifier unique to that assembly,

is a Hierarchy_of_composition_of_facility.

This identification algorithm gives each Facility an identification of the form "MBB/system/sub-system/...".

In this case the purpose of the hierarchy is identification (a Class_of_activity).

NOTE 1 – The same Facility can be part of different Hierarchies_of_composition_of_facility that have different purposes.

4.2.93   Hierarchy_of_composition_of_material

A Hierarchy_of_composition_of_material is a set of Composition_of_material associations (see 4.2.62) that is a decomposition hierarchy.

A Hierarchy_of_composition_of_material is a set of composition associations such that no Material object is referenced as a part more than once.

> EXAMPLE 133 – The set of composition associations that assigns each weld Material in Much Binding B either to the item on one side or the item on the other, so that each weld is inspected once and once only along with the item, is a Hierarchy_of_composition_of_material.

> In this case the purpose of the hierarchy is weld inspection (a Class_of_activity).

> NOTE 1 – The same Material object can be part of different Hierarchies_of_composition_of_material that have different purposes.

4.2.94   Holding_of_information_content_by_information_carrier

A Holding_of_information_content_by_information_carrier is a association between an Information_content (see 4.2.98) and an information holder that indicates the information holder holds the Information_-content.

> EXAMPLES

> 134 – The association between the Much Binding B power station safety case and the document with reference "MBB/SCR/12345", that indicates the safety case is held by the document, is a Holding_of_information_-content_by_information_carrier.

> In this case the information holder is a typical Physical_information_carrier.

> 135 – The association between the Text of the Much Binding B power station safety case:

> "\begin{document} .... \end{document}"

> and the file with name "mbb_scr_12345.tex", that indicates the safety case is held by the file, is a Holding_-of_information_content_by_information_carrier.

> In this case the information holder is a Logical_information_carrier.

> NOTE 1 – The Text held by file mbb_scr_1234.tex in example 135 can be in a format such as LaTeX or SGML that is a document definition.

> In this case, there are two associations between the Text and the document MBB/SCR/12345 in example 134, as follows:

> – a Holding_of_information_content_by_information_carrier that indicates the document holds the Text; and

> – a Definition_of_object_by_information_content that indicates the Text is a definition of the document.

The data associated with a Holding_of_information_content_by_information_carrier are the following:

– held;

– holder.

4.2.94.1 held

The held specifies the Information_content that is stored on the Logical_information_carrier or on the Physical_information_carrier.

4.2.94.2 holder

The holder specifies the Logical_information_carrier (see 4.2.108) or a Physical_information_content (see 4.2.108) that stores the Information_content.

> NOTE 1 – The different application objects that can be an information holder are presented in the ARM diagrams by the SELECT TYPE Holder.

4.2.95 Holding_of_organizational_position_by_person

A Holding_of_organizational_position_by_person is an association between a Person (see 4.2.122) and an Organization (see 4.2.114) that indicates the Person holds the organizational position that is the Organization.

> NOTE 1 – A position within an Organization is regarded as an Organization.

> EXAMPLES

> 136 – The association between J. Doe and the Much Binding B Project Management Team, that indicates J. Doe is a member of the team, is a Holding_of_organizational_position_by_person.

> 137 – The association between R. Roe and the position Chief HVAC Engineer, that indicates R. Roe holds the position, is a Holding_of_organizational_position_by_person.

The data associated with a Holding_of_organizational_position_by_person are the following:

– held;

– holder.

4.2.95.1 held

The held specifies the Organization that is the team which the Person is a member of, or the position the Person holds.

4.2.95.2 holder

The holder specifies the Person that is a member of the team or holds the position.

4.2.96   Identification_of_object_by_information_content

An Identification_of_object_by_information_content is a type of Description_of_object_by_information_-
content (see 4.2.79) that associates an Identified_object (see 4.2.96.1) with an identifier that is an Infor-
mation_content (see 4.2.98).

> EXAMPLE 138 –   The association between the Facility V1a in annex L and the Text "V1a", that indicates
> the Text is an identifier of the Facility, is an Identification_of_object_by_information_content.

> NOTE 1 –   An Information_content can be classified by a Class_of_information_content. Standard Class_of_-
> information_content objects for identification include Name and Label (see annex M, instance 519).

> EXAMPLE 139 –   The Text "V1a" is classified as a Label.

This part of ISO 10303 requires that an Identification_of_object_by_information_content be instanciated
only for a case in which the describing Information_content is Text (see 4.2.171).

> NOTE 2 –   Identification by other subtypes of Information_content is not supported by the AIM schema
> defined in clause 5.2.

The data associated with an Identification_of_object_by_information_content are the following:

– described;

– describing.

4.2.96.1   described

The described specifies the application object that is identified by the Information_content.

The application objects that may be identified are as follows:

– Activity;

– Approval_of_object;

– Beginning_or_end_effect;

– Class_of_activity;

– Class_of_annotation_element;

– Class_of_facility;

– Class_of_information_content;

– Class_of_involvement;

– Class_of_material;

– Class_of_property;

– Connection_of_facility;

– Connection_of_material;

– Facility;

– Feature;

– Hierarchy_of_composition_of_facility;

– Hierarchy_of_composition_of_material;

– Information_content;

– Material;

– Organization;

– Orientation;

– Person;

– Point_in_space;

– Point_in_time;

– Property;

– Provision_of_service_by_resource.

> NOTE 1 – The different application objects that can be identified are presented in the ARM diagrams by the SELECT TYPE Identified_object.

4.2.96.2   describing

The describing specifies the Information_content that is the identifier of the Identified_object.

4.2.97   Inclusion_of_association_as_valid_within_context

An Inclusion_of_association_as_valid_within_context is an association between a data context object and another object that indicates the other object within the relevant data for the data context object.

> NOTES
>
> 1 – The term 'data context object' is defined in 3.5.9 and the term relevant data is defined in 3.5.27.
>
> 2 – The operation of Inclusion_of_association_as_valid_within_context is described by the inheritance rules in 4.2.99.

EXAMPLE 140 – Consider example 145 in 4.2.99.

The following objects are within the relevant data for recipient Facility (rev 1), but not for the source Facility (rev 0)':

– the Identification_of_object_by_information_content association between the recipient Facility and the Text "rev 1"; and

– the Possession_of_property_by_object association between the steam system (a Facility) and the output of 4000kW (a Property).

The Identification_of_object_by_information_content association between the recipient Facility and the Text "rev 1" does not require an Inclusion_of_association_as_valid_within_context because it has the recipient Facility as an attribute.

The Possession_of_property_by_object association between the steam system (a Facility) and the output of 4000kW (a Property) requires an Inclusion_of_association_as_valid_within_context because it does not have the recipient Facility as an attribute.

An Inclusion_of_association_as_valid_within_content is required to indicate that the association between the steam system and an output of 4000kW is relevant data for rev 1 but not about rev 0. Hence the association between:

– the Facility rev 1; and

– the Possession_of_property_by_object association between the steam system (a Facility) and the output of 4000kW (a Property),

that indicates the Possession_of_property_by_object is relevant to the Facility rev 1, is an Inclusion_of_association_as_valid_within_context.

The data associated with a Inclusion_of_association_as_valid_within_context are the following:

– context;

– included.

4.2.97.1 context

The context specifies the data context object for which the included object is within the relevant data.

The application objects that may be a data context object are as follows:

– Facility.

NOTE 1 – The different application objects that can be a data context object are presented in the ARM diagrams by the SELECT TYPE Inheritance_context_object.

4.2.97.2 included

The included specifies the object that is within the relevant data for the data context object.

Each application object may be included within relevant data by an Inclusion of association as valid within context.

NOTE 1 – The application objects that can be included are presented in the ARM diagrams by the SELECT TYPE Inheritable object.

4.2.98   Information content

An Information content is data that can be processed by a Person or by a computer program to obtain knowledge.

NOTE 1 – Information content is the data, not the knowledge that is obtained by processing the data. Different people or different computer programs can obtain different knowledge from the same Information content.

The knowledge that a Person or computer program can obtain from Information content is unpredictable, and is not within the scope of this part of ISO 10303.

Each Information content may be a:

– 2d box dimensions (see 4.2.1);

– 2d curve (see 4.2.2);

– 2d direction range (see 4.2.3)

– 2d placement (see 4.2.4);

– 2d scale (see 4.2.5);

– 2d vector (see 4.2.6);

– Binary object (see 4.2.22);

– Colour rgb (see 4.2.56);

– Date and time (see 4.2.72);

– Line pattern (see 4.2.106);

– Numeric value (see 4.2.112);

– Text (see 4.2.171);

– Text appearance (see 4.2.172);

– Tiling pattern (see 4.2.175).

An Information content may be none of these, in two cases:

– the Information content is a composition of other instances of Information content;

– the Information content records the existence of data but does not hold the data.

NOTE 2 – All data must be held somewhere in order to exist. An Information content that does not hold the data, is a record of data that is held elsewhere. In this case the identification of the Information content provides an external reference to the data that is held elsewhere.

EXAMPLES

141 – The Much Binding B power station safety case is an Information content.

An identification of this Information content is the Text (see 4.2.171) "The Much Binding B power station safety case".

142 – The LaTeX source for the Much Binding B power station safety case in example 141 is an Information-content that is Text (see 4.2.171) as follows:

"\begin{document} .... \end{document}".

The equivalent SGML document source for the Much Binding B power station safety case is another Text.

There may be the following associations between the LaTeX and the SGML Text:

– Version association between objects (see 4.2.186) that indicates one Text replaces the other;

– Derivative association between objects (see 4.2.76) that indicates one Text has been derived from the other, but does not necessarily replace the other;

– Alternative association between objects (see 4.2.9) that indicates the two Texts are alternatives without either one being preferred.

143 – The Information content in example 141 is held the document with identification "MBB/SCR/12345". The document is a Typical object (see 4.2.178) and a Physical information carrier (see 4.2.124).

The LaTeX source in example 142 is Text that defines the document with identification "MBB/SCR/12345".

The association between the LaTeX source and the document, that indicates the LaTeX source defines the document, is a Definition of object by information content (see 4.2.73).

144 – The LaTeX source in example 142 is held by the file within identification "mbb scr 12345.tex". The file is a Facility (see 4.2.89) and a Logical information carrier (see 4.2.108).

The association between the LaTeX source and the file, that indicates the LaTeX source is held by the file, is a Holding of information content by information carrier (see 4.2.94).

4.2.99   Inheritance of valid associations

An Inheritance of valid associations is an association between a source object and a recipient object that indicates relevant data for the source object are inherited as relevant data for the recipient object.

NOTES

1 – The term 'data context object' is defined in 3.5.9 and the term relevant data is defined in 3.5.27.

2 – If an object is not within the relevant data for a data context object, then it does not participate in a description of the data context object. It is as if the two objects exist during non-overlapping periods of time.

The rules that govern the data inheritance are as follows:

a) Unless excluded by an Exclusion_of_association_from_inheritance (see 4.2.88), each object that is within the relevant data for the source is also within the relevant data for the recipient.

b) The objects that are within the relevant data for a data context object are as follows:

– each object that is not referenced by any Inclusion_of_association_as_valid_within_context or by any Exclusion_of_association_from_inheritance;

– each object that is specified to be within the relevant data by an Inclusion_of_association_as_-valid_within_context;

– each object that has the context object as an attribute.

– each object that is specified as inherited by an Inheritance_of_valid_associations according to these rules.

c) Each object within the relevant data for the recipient that has the source object as an attribute, shall be interpreted as part of the description of the recipient as if that attribute were the recipient object.

A context object may be the recipient for only one Inheritance_of_valid_associations. A context object may be the source for many Inheritance_of_valid_associations.

NOTE 3 – An Inheritance_of_valid_associations does not indicated any relationship between the source and the recipient objects. It merely records that data is inherited.

A relationship between the source and recipient is recorded by a Version_association_between_objects (see 4.2.186), Derivative_association_between_objects (see 4.2.76), Alternative_association_between_objects (see 4.2.9),

EXAMPLE 145 – A process plant is being designed that contains a large pump with a driver and a steam system. There are two instances of the intended Facility as follows:

rev 0: in which the driver is not classified and in which the steam system has an output of 3000kW.

rev 1: in which the driver is classified as a steam turbine and in which the steam system has an output of 4000kW.

All other data about the two intended Facility objects is the same.

The association between the Facility that is rev 0 and the Facility that is rev 1, that indicates all the data about rev 0 is also valid for rev 1 (unless explicitly excluded), is an Inheritance_of_valid_associations.

This example is extended by example 125 in 4.2.88, and by example 140 in 4.2.97.

The data associated with a Inheritance_of_valid_associations are the following:

– recipient;

– source.

4.2.99.1   recipient

The recipient specifies the object that inherits data from the source.

The application objects that may inherit data are as follows:

– Facility.

> NOTE 1 – The different application objects that can be a recipient of inherited data are presented in the ARM diagrams by the SELECT TYPE Inheritance_context_object.

4.2.99.2   source

The source specifies the object that the data is inherited from.

The application objects that data may be inherited from are as follows:

– Facility.

> NOTE 1 – The different application objects that can be a recipient of inherited data are presented in the ARM diagrams by the SELECT TYPE Inheritance_context_object.

4.2.100   Inner_boundary_for_annotation_area

An Inner_boundary_for_annotation_area is an association between an Annotation_area
(see 4.2.10) and a 2d_curve (see 4.2.2) that indicates the 2d_curve describes an inner boundary for the Annotation_area.

The coordinate system of the Annotation_area is the placement coordinate system (see 3.3) of the 2d_-curve.

> EXAMPLE 146 – The shaded area in figure 6 is an Annotation_area, that is larger than normal. It has one inner boundary that is indicated.

The data associated with a Inner_boundary_for_annotation_area are the following:

– described;

– describing.

4.2.100.1   described

The described specifies the Annotation_area that has the inner boundary.

4.2.100.2   source

The describing specifies the 2d_curve that is the description of the inner boundary.

4.2.101   Intended_object

An Intended_object is a type of Life_cycle_object (see 4.2.105) that is intended to exist at some time.

> NOTES
>
> 1 – The term 'intended' is defined in 3.5.15.
>
> 2 – An Intended_object is an intention, such as a requirement, plan or expectation, whereas an Actual_object (see 4.2.8) is that which comes to pass.
>
> 3 – An Actual_object that is the realisation of an Intended_object can be associated with the Intended_object by a Realization_of_intended_object_by_actual association.
>
> The Intended_object and the Actual_object can have the same tag (say), but other information about them is usually different.
>
> 4 – An Intended_object that is a requirement remains of interest after the Intended_object that is the plan or the Actual_object has been created. It can be necessary to return to the original requirement, for a later re-design or re-vamp.
>
> EXAMPLE 147 – In annex L, the heat exchanger with tag E-4507 is an intended Facility. Process information about the intended duty of the heat exchanger and its functional connectivity is recorded by associations with the intended Facility.
>
> A specific physical component is designed or selected to perform the service with tag E-4507. This is the intended Material designated E-4507-prop3. Information specific to the design of the specific physical component is recorded by associations with the intended Material.
>
> The shell and tube heat exchanger manufactured by J. Bloggs and Co. and delivered to the Much Binding refinery to be installed as E-4507, is an actual Material object.

4.2.102   Invisible_annotation_element_in_view

An Invisible_annotation_element_in_view is an association between a View_derivation_for_annotation_-element (see 4.2.187) and an Annotation_element (see 4.2.12) that indicates the Annotation_element is excluded from the view.

The derived Annotation_element defined by the View_derivation_of_annotation_element does not contain areas of colour, shading or texture corresponding to the excluded Annotation_element.

The excluded Annotation_element shall be part of the source Annotation_element for the View_derivation_-of_annotation_element.

The data associated with a Invisible_annotation_element_in_view are the following:

– excluded;

– view.

4.2.102.1 excluded

The excluded specifies the Annotation_element that is excluded from the view.

4.2.102.2 view

The view specifies the View_derivation_of_annotation_element that is the derivation from which the Annotation_element is excluded.

4.2.103 Involvement_of_object_in_activity

An Involvement_of_object_in_activity is an association between an involved object and Activity (see 4.2.7) that indicates the involved object plays a role in the Activity, by contributing to the performance of the Activity or being effected by it.

EXAMPLES

148 – The association between the typical Process_material design_case_1_input_stream that flows through the suction port of pump P-4506-A, specified by design case 1 in annex L), and the typical Activity design_case_1_pumping, that indicates the typical Material is involved in the Activity, is an Involvement_of_object_in_activity.

149 – The association between the Facility that is P-4506-A in annex L and the typical Activity that is design_case_1_pumping is an Involvement_of_object_in_activity.

150 – The association between the Facility that is P-4506-A in annex L and the Activity that is approve_P-4506-A_for_procurement is an Involvement_of_object_in_activity.

151 – The association between the Facility that is P-4506-A in annex L and the Activity that is re-design_for_a_single_pump_to_replace_P-4506-A_and_P-4506-B is an Involvement_of_object_in_activity.

This part of ISO 10303 requires that an Involvement_of_object_in_activity be instanciated only for specific combinations of:

– the Class_of_involvement (see 4.2.29) for the Involvement_of_object_in_activity;

– the Class_of_activity (see 4.2.24) for the involver Activity;

– the selected involved object.

These combinations are shown in table 2.

NOTE 1 – Instances of Involvment_of_object_in_activity for other combinations of Class_of_involvement, involved object and Class_of_activity is not supported by the AIM schema defined in clause 5.2.

An Involvement_of_object_in_activity is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Involvement_of_object_in_activity shall associate an actual involved object with an actual Activity. An intended Involvement_of_object_in_activity may associate either an intended or actual involved object with either an intended or actual Activity.

Table 2 – Required instances of Involvement_of_object_in_activity

Class_of_involvement	involved object	Class_of_activity
assessed object (see annex M, instance 530)	any	Assess (see annex M, instance 1)
Assessment_purpose (see annex M, instance 531)	Activity (see 4.2.7)	Assess (see annex M, instance 1)
Assessment_purpose (see annex M, instance 531)	Class_of_activity (see 4.2.24)	Assess (see annex M, instance 1)
Assessment_result (see annex M, instance 532)	Beginning_or_end_effect (see 4.2.21) of an Approval_of_object (see 4.2.16)	Assess (see annex M, instance 1)
Input_material (see annex M, instance 533)	Process_material (see 4.2.136)	Transform_material (see annex M, instance 4)
Input_material (see annex M, instance 533)	Physical_information_carrier (see 4.2.124)	Transform_material (see annex M, instance 4)
Material_destination (see annex M, instance 534)	Facility (see 4.2.89)	Transfer_material (see annex M, instance 3)
Material_destination (see annex M, instance 534)	Material (see 4.2.110)	Transfer_material (see annex M, instance 3)
Material_source (see annex M, instance 535)	Facility (see 4.2.89)	Transfer_material (see annex M, instance 3)
Material_source (see annex M, instance 535)	Material (see 4.2.110)	Transfer_material (see annex M, instance 3)
Output_material (see annex M, instance 536)	Process_material (see 4.2.136)	Transform_material (see annex M, instance 4)
Output_material (see annex M, instance 536)	Physical_information_carrier (see 4.2.124)	Transform_material (see annex M, instance 4)
Performer (see annex M, instance 537)	Person (see 4.2.122)	any
Performer (see annex M, instance 537)	Organization (see 4.2.114)	any
Performer (see annex M, instance 537)	Facility (see 4.2.89)	any
Performer (see annex M, instance 537)	Material (see 4.2.110)	any
Referenced_in_design (see annex M, instance 538)	any	Design (see annex M, instance 2)
Result_of_design (see annex M, instance 539)	any	Design (see annex M, instance 2)
Transferred_material (see annex M, instance 540)	Process_material (see 4.2.136)	Transfer_material (see annex M, instance 3)

NOTE 2 – The intent for a involvement can be recorded between:

– an object that exist with a continuing actual activity;

– an object that exists with an intended Activity; and

– an intended object with and intended Activity.

The data associated with an Involvement_of_object_in_activity are the following:

– involver;

– involved.

4.2.103.1   involver

The involver specifies the Activity in which the involved object plays a role.

Each application object may be involved in an Activity.

NOTE 1 – The application objects that can be involved are presented in the ARM diagrams by the SELECT TYPE Involved_object.

4.2.103.2   involved

The involved specifies the object that plays a role in the Activity.

4.2.104   Leader_terminator_for_annotation_curve

A Leader_terminator_for_annotation_curve is a type of Relative_placement_of_annotation_element (see 4.2.162) that associates an Annotation_curve (see 4.2.11) and an Annotation_point (see 4.2.13) and indicates the Annotation_point is placed as a terminator symbol for the Annotation_curve.

The origin of the coordinate system of the Annotation_point is placed at the end point of the curve describing the centre-line of the Annotation_curve.

The Annotation_point is oriented such that the x axis of the coordinate system for the Annotation_point is a tangent to the curve pointing in the direction with a positive topological sense (see 3.3).

EXAMPLE 152 – The shaded area in figure 15 is a Annotation_curve and a Terminator_symbol that are larger than normal.

The coordinate axes of the Terminator_symbol are denoted x' and y'.

The end point of the Annotation_curve is shown as a black dot, and the direction of tangent to the centre line with a positive topological sense is indicated by the arrow labelled x.

The data associated with a Leader_terminator_for_annotation_curve are the following:

– referenced;

– placed.
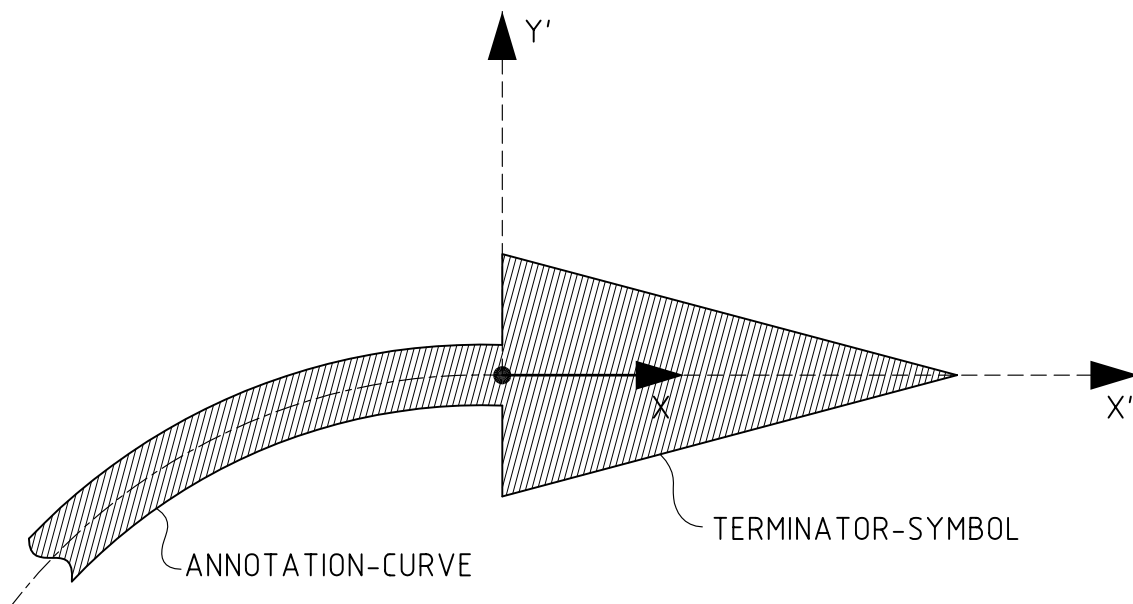
Figure 15 – An Annotation_curve with Terminator_symbol

4.2.104.1   referenced

The referenced specifies the Annotation_curve with respect to which the Annotation_point is placed.

4.2.104.2   placed

The placed specifies the Annotation_point that is placed at the end of the curve.

4.2.105   Life_cycle_object

A Life_cycle_object is something that exists in the real world or in the minds of people that may be recorded as an application object by this part of ISO 10303, and that may be either actual (see 3.5.1) or intended (see 3.5.15).

Each Life_cycle_object is one of:

– Activity;

– Approval_of_object;

– Beginning_or_end_effect;

– Composition_of_activity;

– Composition_of_facility;

– Composition_of_material;

– Connection_of_facility;

– Connection_of_material;

– Facility;

– Feature;

– Involvement_of_object_in_activity;

– Material;

– Orientation_of_material;

– Orientation_of_resource_for_facility;

– Point_in_space_of_material;

– Point_in_space_of_resource_for_facility;

– Possession_of_connector_by_facility;

– Possession_of_feature_by_material;

– Possession_of_property_by_each_member_of_collection;

– Possession_of_property_by_object;

– Provision_of_service_by_material;

– Temporal_sequence_of_activity;

– Topologic_sequence_of_facility;

– Usage_of_facility_in_connection;

– Usage_of_feature_in_connection_of_material;

– Usage_of_material_in_connection.

NOTE 1 – These are the application objects in this part of ISO 10303 that can be actual or intended.

All application objects that are not Life_cycle_objects, are always actual within the scope of this part of ISO 10303.

Each Life_cycle_object is also one of:

– Actual_object (see 4.2.8);

– Intended_object (see 4.2.101).

NOTES

2 – All classes are actual. In the real world, classification authorities can intend to create a class, but the recording of such an intention is not within the scope of this part of ISO 10303.

3 – All classification associations are actual. In the real world there can be an intention to change the class of an object, but the recording of such an intention is not within the scope of this part of ISO 10303.

4 – All Information_contents are actual. In the real world, there can be an intention to create a description or an identification of an object, but the recording of such an intention is not within the scope of this part of ISO 10303.

5 – All Property objects are actual. The temperature that is 400 degrees C exists. The possession of that temperature by an object can be intended or actual.

4.2.106   Line_pattern

A Line_pattern is a type of Information_content (see 4.2.98) that describes the dimensions along a curve of areas of colour, shading or texture and of gaps between them. The areas of colour, shading or texture are parts of an Annotation_curve (see 4.2.11).

EXAMPLE 153 – The shaded area in figure 7 is an Annotation_curve, that is larger than normal. The dimensions of the Annotation_curve specified by the Line_pattern are indicated.

NOTES

1 – A Line_pattern does not describe the colour of an Annotation_curve. A colour is associated by a Possession_of_property_by_object (see 4.2.134).

2 – A Line_pattern does not describe the width of an Annotation_curve. A width is associated by a Width_for_annotation_curve (see 4.2.188).

The data associated with a Line_pattern are the following:

– pattern.

4.2.106.1   pattern

The pattern specifies an even number of Numeric_values (see 4.2.112) that describe lengths. The first describes the dimension along the curve of an area of colour, shading or texture, and the second describes the dimension along the curve of a gap without colour, shading of texture.

The Numeric_values in the pattern are taken in pairs with the first of the pair describing the dimension of a coloured area, and the second of the pair the dimension of a gap.

After the end of the last gap, the pattern repeats.

The sequence of lengths in a Line_pattern are with respect to the positive topological sense (see 3.3) of the centre line curve for an Annotation_element.

4.2.107   Line_pattern_for_annotation_curve

A Line_pattern_for_annotation_curve is an association between an Annotation_curve (see 4.2.11) and a Line_pattern (see 4.2.106) that indicates the Line_pattern describes the Annotation_curve.

> NOTE 1 –   The Line_pattern describes the sequence of areas of colour, shading or texture that are the Annotation_curve and the gaps between them.

The data associated with a Line_pattern_for_annotation_curve are the following:

– described;

– describing.

4.2.107.1   described

The described specifies the Annotation_curve that is described by the Line_pattern.

4.2.107.2   describing

The describing specifies the Line_pattern that describes the Annotation_curve.

4.2.108   Logical_information_carrier

A Logical_information_carrier is a type of Facility (see 4.2.89) that holds, or can hold, Information_-content (see 4.2.98).

> EXAMPLE 154 –   The file with name "mbb_scr_12345.tex", that holds the Much Binding B power station safety case, is a Logical_information_carrier.

> NOTE 1 –   Standard classes for Facility objects that are information carriers are given in table M.13.

4.2.109   Maintenance_of_identification_scheme

A Maintenance_of_identification_scheme is an association between an Organization (see 4.2.114) and an identification scheme, that indicates the Organization maintains the identification scheme.

An identification scheme is a Class_of_information_content (see 4.2.27) that classifies identifiers according to their form. For a Text (see 4.2.171) identifier, the classification is according to the content.

> EXAMPLE 155 –   A Text identifier with a content of the form

```
"JBC/ <year> / <commodity code> / <sequence number>"
```

is classified as a J. Bloggs and Co. asset identifier.

An identifier of this form is "JBC/P46A/12345".

An Organization that maintains an identification scheme controls the creation and use of identifiers with a particular form.

EXAMPLES

156 – The association between the Organization J. Bloggs and Co. and the Class of information content J. Bloggs and Co. asset identifier, that indicates the asset identifiers are created by J. Bloggs and Co., is a Maintenance of identification scheme.

157 – An identifier of the form:

```
"<one, two or three letters> <one, two or three numbers> <letter>"
```

is classified as a UK motor vehicle licence number.

The association between the Organization Her Majesty's Government and the Class of information content UK motor vehicle licence number, that indicates identifiers within the class are created and are assigned to motor vehicles by the Government, is a Maintenance of identification scheme.

The data associated with a Maintenance of identification scheme are the following:

– maintainer;

– scheme.

4.2.109.1 maintainer

The maintainer specifies the Organization that maintains the identification scheme.

4.2.109.2 scheme

The scheme specifies the Class of information content that is the identification scheme maintained by the Organization.

4.2.110 Material

A Material object is a type of Typical or specific object (see 4.2.177) that is a quantity of matter or space.

NOTES

1 – A Material object can be the resource for a Facility (see 4.2.89).

A Facility is a functional view of Material objects that provide a service.

2 – A Material object within the scope of this part of ISO 10303 is within a process plant or a system that connects process plants.

3 – The term 'material' is used in the 'materials management' sense and not in the 'materials science' sense.

4 – Activity objects classed as engineering design, construction, maintenance and demolition are principally concerned with Material objects.

5 – An actual Material object can be identified by a serial number. A serial number remains unchanged when a Material object is moved and used as a resource for a different Facility, or is put in store and not used at all.

EXAMPLE 158 – In annex L, the heat exchanger with tag E-4507 is an intended Facility. A specific physical component is designed or selected to perform the service with tag E-4507. This is the intended Material designated E-4507-prop3.

The shell and tube heat exchanger manufactured by J. Bloggs and Co. and delivered to the Much Binding refinery to be installed as E-4507, is an actual Material object. Information about the delivered shell and tube heat exchanger that is obtained by measurement is recorded by associations with the actual Material object.

A Material object is either a Specific_object (see 4.2.168) or a Typical_object (see 4.2.178).

A Material object that is also a Specific_object has at some time, or is intended to have at some time an existence in the real world.

NOTES

6 – A specific Material object can be derived by reference to a typical Material object.

7 – A specific Material object can be either intended or actual.

EXAMPLE 159 – The 2 x 1 1/2 inch reducers R1a and R1b in annex L are both specific Material objects.

Both of these specific Material objects are defined by reference to the same typical Material object.

A Material object that is a also a Typical_object is a generic, parametric or reference concept.

NOTES

8 – A typical Material is a reference object from which an intended, and ultimately an actual, specific Material object can be derived.

9 – A collection of typical Material objects is itself a typical Material object.

A typical Material object that is a collection can be a catalogue of standard or reference Material objects.

10 – A standard part in a catalogue of standard parts is a typical Material object.

EXAMPLES

160 – 4 inch pipe is a typical Material object.

In this case the typical Material object is parameterised, because it has a value for its inside diameter, but not for its length.

161 – 2 X 1 inch, #160, seamless butt-weld concentric reducer in carbon steel is a typical Material object. A process plant can contain one or more specific Material objects derived from this typical Material object (i.e. of this type).

In this case the typical Material object is generic but not parameterised, because no further information is needed to define an intended specific Material object derived from it.

162 – The collection of pumps produced by J. Bloggs and Co., a catalogue of standard parts, is a collection of typical Material objects and hence itself a typical Material object.

163 – The document called "ISO 10303 part 221" is a Physical_information_carrier and a typical Material object.

The Postscript source for the document called "ISO 10303 part 221", held by ISO and by National standards bodies, is Information_content.

The paper and ink copy of the document called "ISO 10303 part 221" on your desk is a Physical_information_carrier and a Specific_object.

4.2.111 Numeric_operator

A Numeric_operator indicates whether a Numeric_value (see 4.2.112) is a single value or a bound of a range.

A Numeric_operator shall be one of the standard operators shown in table 3.

4.2.112 Numeric_value

A Numeric_value is a type of Information_content (see 4.2.98) that is a numeric value.

A Numeric_value is qualified by a Numeric_operator (see 4.2.111).

A Numeric_value is either an integer number or a real number.

A Numeric_value may have a Unit_of_measure (see 4.2.179).

EXAMPLES

164 – Equal to 5 is a Numeric_value.

Equal to 5 can be a description of the Property that is 5 bolt holes. The Property is possessed by the flange on the discharge nozzle of the pump that provides the service P-4506-A in annex L.

165 – Equal to 15 bar gauge is a Numeric_value.

Equal to 15 can be a description of the Property that is an operating pressure of 15 bar gauge. The property is possessed by the valve V1a in annex L.

NOTE 1 – An Information_content can be a composition of two Numeric_values, that are range bounds. The composite Information_content is a range with an upper and a lower bound.

Table 3 – Standard Numeric_operators

numeric_operator	definition of the Numeric_value
equal_to	The Numeric_value is the single integer or real number that is specified.
less_than	The Numeric_value is the semi-infinite range of integer or real numbers for which the specified integer or real number is an upper bound. The specified integer or real number is not within the range.
less_than_or_equal_to	The Numeric_value is the semi-infinite range of integer or real numbers for which the specified integer or real number is an upper bound. The specified integer or real number is within the range.
greater_than	The Numeric_value is the semi-infinite range of integer or real numbers for which the specified integer or real number is a lower bound. The specified integer or real number is not within the range.
greater_than_or_equal_to	The Numeric_value is the semi-infinite range of integer or real numbers for which the specified integer or real number is a lower bound. The specified integer or real number is within the range.

EXAMPLE 166 – Greater that 15 bar gauge and less that 18 bar gauge is an Information_content. It is the composition of the Numeric_value greater that 15 bar gauge, and the Numeric_value less that 18 bar gauge.

The Information_content can be a description of the Property that is an operating pressure range.

The data associated with a Numeric_value are the following:

– content;

– qualifier;

– unit.

4.2.112.1   content

The content specifies the number (integer or real) for the Numeric_value.

4.2.112.2   qualifier

The qualifier specifies whether the Numeric_value is a nominal value or a range bound as shown in table 3.

4.2.112.3   unit

The referenced specifies the Unit_of_measure for the Numeric_value.

A Unit_of_measure need not be specified for a particular Numeric_value.

4.2.113   Operation_of_facility_by_organization

An Operation_of_facility_by_organization is an association between a Facility (see 4.2.89) and an Organization (see 4.2.114) that indicates the Facility is operated by the Organization.

The data associated with a Operation_of_facility_by_organization are the following:

– operated;

– operator.

EXAMPLE 167 – The association between the Much Binding B power station and the Organization J. Bloggs Power Limited, that indicates J. Bloggs Power Limited operates the station, is an Operation_of_-facility_by_organization.

4.2.113.1   operated

The operated specifies the Facility that is operated.

4.2.113.2   operator

The operator specifies the Organization that operates the Facility.

4.2.114   Organization

An Organization is a legal or administrative entity, that is not a single individual.

> NOTES
>
> 1 – A position within an Organization is regarded as an Organization.
>
> 2 – A single individual is a Person (see 4.2.122).
>
> EXAMPLES
>
> 168 – The UK Nuclear Installation Inspectorate is an Organization.
>
> 169 – J. Bloggs and Co. Limited (registered in England) is an Organization, that is recognized by English company law.
>
> 170 – Piping design department of J. Bloggs and Co. is an Organization that exists for administrative purposes within J. Bloggs and Co. Limited.
>
> 171 – The Much Binding B Project Management Team is an Organization that exists within J. Bloggs and Co..
>
> 172 – The position of Chief HVAC Engineer of J. Bloggs and Co. is an Organization that exists within J. Bloggs and Co..

4.2.115   Orientation

An Orientation is a direction or set of directions in the Euclidean space chosen such that the earth is at rest.

> NOTES
>
> 1 – General information about an Orientation, such as identification and description are within the scope of this part of ISO 10303.
>
> A numeric description of an Orientation with respect to a coordinate system is not within the scope of this part of ISO 10303.
>
> 2 – An Orientation can be associated with either a Material object or a Facility. If an Orientation is associated with a Facility, it applies to each Material object that provides the service.
>
> EXAMPLES
>
> 173 – The direction described as "parallel to axis of the vessel" is an Orientation.

174 – The direction described as "vertically upwards" is an Orientation.

4.2.116   Orientation_of_material

An Orientation_of_material is an association between a Material (see 4.2.110) and an Orientation (see 4.2.115) that indicates the Material has the Orientation.

> EXAMPLE 175 – The association between the nozzle that provides the service for V-4506 - inlet 1 in annex L and the Orientation described as "vertically upwards" is an Orientation_of_material.

An Orientation_of_material is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Orientation_of_material shall associate an actual Material object with an actual Orientation. An intended Orientation_of_material shall associate either an intended Material object or an actual Material object with an actual Orientation.

The data associated with a Orientation_of_material are the following:

– how;

– what.

4.2.116.1   how

The how specifies the Orientation that is possessed by the Material object.

4.2.116.2   what

The what specifies the Material that possesses the Orientation.

4.2.117   Orientation_of_resource_for_facility

An Orientation_of_resource_for_facility is an association between a Facility (see 4.2.89) and an Orientation (see 4.2.115) that indicates a resource for the Facility has the Orientation.

> EXAMPLE 176 – The association between V-4506 inlet 1 (a Connector_of_facility) in annex L and the Orientation described as "vertically upwards" is an Orientation_of_resource_for_facility.

An Orientation_of_resource_for_facility is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Orientation_of_resource_for_facility shall associate an actual Facility with an actual Orientation. An intended Orientation_of_resource_for_facility shall associate either an intended Facility or an actual Facility with an actual Orientation.

> NOTE 1 – An intended Orientation for an actual Facility records the intent that a Material object that is installed to perform the existing service shall have the Orientation.

The data associated with a Orientation_of_resource_for_facility are the following:

– how;

– what.

4.2.117.1   how

The how specifies the Orientation that is possessed by a resource for the Facility.

4.2.117.2   what

The what specifies the Facility for which the Orientation is possessed by a resource.

4.2.118   Outer_boundary_for_annotation_area

An Outer_boundary_for_annotation_area is an association between an Annotation_area (see 4.2.10) and a 2d_curve (see 4.2.2) that indicates the 2d_curve describes the outer boundary for the Annotation_area.

The coordinate system of the Annotation_area is the placement coordinate system (see 3.3) of the 2d_-curve.

> EXAMPLE 177 – The shaded area in figure 6 is an Annotation_area, that is larger than normal. The outer boundary is indicated.

The data associated with a Outer_boundary_for_annotation_area are the following:

– described;

– describing.

4.2.118.1   described

The described specifies the Annotation_area that has the outer boundary.

4.2.118.2   describing

The describing specifies the 2d_curve that is the description of the outer boundary.

4.2.119   Ownership_of_intellectual_property_by_organization

An Ownership_of_intellectual_property_by_organization is an association between an Information_content (see 4.2.98) and an Organization (see 4.2.114) that indicates the Organization owns the intellectual property rights to the Information_content.

> NOTES
>
> 1 – In the real world, only an Organization that is a legal entity can own anything.
>
> 2 – The meaning of the term 'ownership' depends upon national legislation, and is not specified by this part of ISO 10303.
>
> 3 – An Information_content can be owned by more that one Organization.

The data associated with a Ownership_of_intellectual_property_by_organization are the following:

– owned;

– owner.

4.2.119.1 owned

The owned specifies the Information_content for which the intellectual property rights are owned.

4.2.119.2 owner

The owner specifies the Organization that owns the intellectual property rights to the Information_-content.

4.2.120 Ownership_of_material_by_organization

An Ownership_of_material_by_organization is an association between a Material object (see 4.2.110) and an Organization (see 4.2.114) that indicates the Organization owns the Material object.

NOTES

1 – In the real world, only an Organization that is a legal entity can own anything.

2 – The meaning of the term 'ownership' depends upon national legislation, and is not specified by this part of ISO 10303.

3 – A Material object can be owned by more that one Organization.

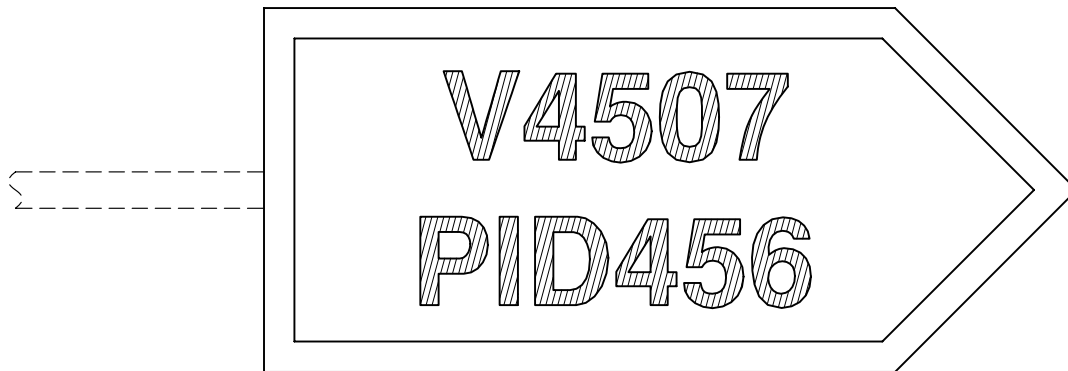The data associated with a Ownership_of_material_by_organization are the following:

– owned;

– owner.

4.2.120.1 owned

The owned specifies the Material object that is owned.

4.2.120.2 owner

The owner specifies the Organization that owns the Material object.

Figure 16 – A Page_connector

4.2.121   Page_connector

A Page_connector is a type of Annotation_element (see 4.2.12) that presents information about connectivity to a person by having a form that can be interpreted by a person as a reference to another Page_connector.

> NOTES
>
> 1 – A Page_connector can reference a different Page_connector displayed on the same drawing sheet, or a Page_connector displayed on a different drawing sheet.
>
> 2 – A Reference_between_page_connector (see 4.2.159) is an association between Page_connectors that indicates each has a form that can be interpreted by a person as a reference to the other.
>
> EXAMPLE 178 –   The shaded area in figure 16 is a Page_connector that is larger than normal.
>
> The Page_connector is an Annotation_element that is an assembly of an Annotation_area and Annotation_text.

4.2.122   Person

A Person is a human being.

> EXAMPLES
>
> 179 – Fred Bloggs is a Person.
>
> 180 – The chief engineer is not a Person. The chief engineer is an Organization (see 4.2.114), albeit a small one, that is part of a larger Organization.
>
> The association between the Person Fred Bloggs and the Organization chief engineer, that indicates Fred Bloggs is employed as the chief engineer, is a Holding_of_organizational_position_by_person (see 4.2.95).

4.2.123   Phase

A Phase is a type of Class_of_substance that is a state of matter.

> NOTE 1 –   Standard Phases are defined by this part of ISO 10303. Further Phases can be defined by a user.

The standard instances of Phase are defined in M.8.

4.2.124   Physical_information_carrier

A Physical_information_carrier is a type of Material (see 4.2.110) that holds, or can hold, Information_-content (see 4.2.98).

> EXAMPLE 181 –   The document with reference "MBB/SCR/12345", that holds the Much Binding B power station safety case, is a Physical_information_carrier.

> In this case the Physical_information_carrier is a Typical_object, and hence a reference concept from which one or more specific Material objects can be derived. Each specific Material object is a copy of the document, perhaps numbered and with an authorised holder.

> NOTE 1 –   Standard classes for Material objects that are information carriers are given in table M.31.

4.2.125   Point_in_space

A Point_in_space is a position within the Euclidean space chosen such that the earth is at rest.

> NOTES

> 1 –   General information about a Point_in_space, such as identification and description are within the scope of this part of ISO 10303.

> A numeric description a Point_in_space with respect to a coordinate system is within the scope of ISO 10303 part 227, and not this part of ISO 10303.

> 2 –   A Point_in_space can be associated with either a Material object or a Facility. If a Point_in_space is associated with a Facility, then it applies to each Material object that provides the service.

> EXAMPLES

> 182 –   "In the turbine hall" is a Text that describes a Point_in_space.

> 183 –   "On the manway blank of vessel V-4506" is a Text that describes a Point_in_space.

4.2.126   Point_in_space_of_material

A Point_in_space_of_material is an association between a Point_in_space (see 4.2.125) and a Material object (see 4.2.110) that indicates the Material object is at the Point_in_space.

The data associated with a Point_in_space_of_material are the following:

– what;

– where.

4.2.126.1 what

The what specifies the Material object that is at the Point_in_space.

4.2.126.2 where

The where specifies the Point_in_space for the Material object.

> NOTE 1 – During its life a Material object can be in the stores for some periods of time, and in the turbine hall (say), providing a service for other periods of time.

A Point_in_space_of_material is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Point_in_space_of_material shall associate an actual Material object with an actual Point_in_space. An intended Point_in_space_of_material shall associate either an intended Material object or an actual Material object with an actual Point_in_space.

4.2.127 Point_in_space_of_resource_for_facility

A Point_in_space_of_resource_for_facility is an association between a Point_in_space (see 4.2.125) and a Facility (see 4.2.89) that indicates the resource for the Facility is, or is intended to be, at the Point_in_space.

A Point_in_space_of_resource_for_facility is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Point_in_space_of_resource_for_facility shall associate an actual Facility with an actual Point_in_space. An intended Point_in_space_of_resource_for_facility shall associate either an intended Facility or an actual Facility with an actual Point_in_space.

> NOTE 1 – An intended Point_in_space for an actual Facility records the intent that a Material object that is installed to perform the existing service shall be at the Point_in_space.

The data associated with a Point_in_space_of_resource_for_facility are the following:

– what;

– where.

4.2.127.1 what

The what specifies the Facility for which the resource has the Point_in_space.

4.2.127.2 where

The where specifies the Point_in_space for the resource.

> NOTE 1 – During the life of a process plant, different Material objects can be the resource for a Facility, however in most cases the Point_in_space associated with the Facility will remain unchanged.

It is possible that in a re-vamp of a plant, the Point_in_space of a Facility can be changed. Perhaps the position at which a temperature is measured can be changed, whilst the instrument is regarded as providing the same Facility both before and after the re-vamp.

4.2.128   Point_in_time

A Point_in_time is an instance in the time that is recorded by a clock at rest on the earth.

NOTE 1 – A Point_in_time can be identified, and described by text. A Point_in_time need not be associated with a Date_and_time.

EXAMPLES

184 – "Day 4 of contract Z1234" is Text that describes a Point_in_time.

185 – The 06:00 GMT on 7th May 1949 is a Date_and_time that describes a Point_in_time.

4.2.129   Point_marker_symbol

A Point_marker_symbol is a type of Annotation_point (see 4.2.13) that is interpreted by a person as an indication of position but not direction.

Standard Point_marker_symbols are defined by this part of ISO 10303.

NOTE 1 – The standard Point_marker_symbol objects are defined within the AIM EXPRESS short listing (see 5.2).

4.2.130   Possession_of_connector_by_facility

A Possession_of_connector_by_facility is an association between a Facility (see 4.2.89) and a Connector_of_facility (see 4.2.68) that indicates the Connector_of_facility is possessed by the Facility.

EXAMPLE 186 – The association between inlet 1 of reflux vessel V-4506 in annex L (a Connector_of_facility) and the reflux vessel V-4506 (a Facility), that indicates the nozzle is possessed by the vessel, is a Possession_of_connector_by_facility.

NOTE 1 – A Connector_of_facility can be possessed by more than one Facility. This occurs when a connection to a part can be made from outside an assembly. In this case the connector of the part is also a connector of the assembly as a whole.

A Connector_of_facility can have different identifications in its two roles (as connector of the part and a connector of the whole). This is supported by giving a single Connector_of_facility two identifiers with different valid contexts.

One identifier is be valid in the context of the part, and the other in the context of the assembly. The context for an identifier is specified by a Valid_context_for_identification (see 4.2.185).

EXAMPLE 187 – Consider the two connected assemblies shown in figure 17. The following pairs of connectors are connected:

– Aa2 and Ab1,
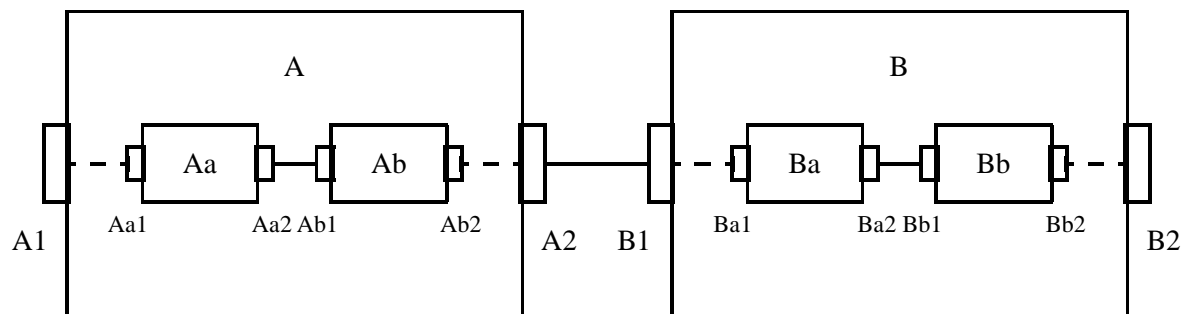
Figure 17 – Connectors of assemblies and parts of assemblies

– A2 and B1,

– Ba2 and Bb1.

The connectors A1 of assembly A and Aa1 of part Aa are the same connector, but are given two different names. This is also the case for the following pairs:

– Ab2 and A2,

– B1 and Ba1,

– Bb2 and B2.

A Possession_of_connector_by_facility is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Possession_of_connector_by_facility shall associate an actual Facility with an actual Connector_of_facility. An intended Possession_of_connector_by_facility can associate either an actual or an intended Facility with an intended Connector_of_facility.

An intended Possession_of_connector_by_facility that associates and actual Facility with an intended Connector_of_facility records an intent to add a connector to an existing Facility.

NOTE 2 – There cannot be an intended possession of an actual Connector_of_facility. An actual Connector_of_facility can only exist if it is actually possessed.

The data associated with a Possession_of_connector_by_facility are the following:

– possessed;

– possessor.

4.2.130.1 possessed

The possessed specifies the Connector_of_facility that is possessed by the Facility.

4.2.130.2   possessor

The possessor specifies the Facility that possesses the Connector_of_facility.

4.2.131   Possession_of_connector_feature_by_annotation_element

A Possession_of_connector_feature_by_annotation_element is an association between an Annotation_element (see 4.2.12) and a Connector_feature_of_annotation_element (see 4.2.67) that indicates the feature is of the Annotation_element.

The data associated with a Possession_of_connector_feature_by_annotation_element are the following:

– possessed;

– possessor.

4.2.131.1   possessed

The possessed specifies the Connector_feature_of_annotation_element that is possessed.

4.2.131.2   possessor

The possessor specifies the Annotation_element that possesses the Connector_feature_of_annotation_element.

4.2.132   Possession_of_feature_by_material

A Possession_of_feature_by_material is an association between a Feature (see 4.2.90) and a Material object (see 4.2.110) that indicates the Material object has the Feature.

> NOTE 1 – A Feature of a part Material object within an assembly is also a Feature of the assembly.

> A Feature usually recorded only if it can be used in a Connection_of_material. If the Feature of the part is only used in connections internal to the assembly, then it is not usually recorded as a Feature of the assembly. If the Feature is used for connections external to the assembly, then it can be recorded as a Feature of the part and of the assembly.

> EXAMPLES

> 188 – The association between the face of the flange to the inlet nozzle of vessel V-4506 in annex L and the flange (a Material object), that indicates the flange has the face as a Feature, is a Possession_of_feature_by_material.

> 189 – The association between the face of the flange to the inlet nozzle of vessel V-4506 in annex L and the assembly of Material objects including the bare vessel, nozzles and flanges providing the service for V-4506, that indicates the assembly has the face as a Feature, is a Possession_of_feature_by_material.

A Possession_of_feature_by_material is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Possession_of_feature_by_material shall associate an actual Material with an actual Feature. An intended Possession_of_feature_by_material may associate either an actual or an intended Material with an intended Feature.

An intended Possession_of_feature_by_material that associates and actual Facility with an intended Feature records an intent to add a Feature to an existing Material.

NOTE 2 – There cannot be an intended possession of an actual Feature. An actual Feature can only exist if it is actually possessed.

The data associated with a Possession_of_feature_by_material are the following:

– possessed;

– possessor.

4.2.132.1   possessed

The possessed specifies the Feature that is possessed by the Material object.

4.2.132.2   possessor

The possessor specifies the Material object that possesses the Feature.

4.2.133   Possession_of_property_by_each_member_of_collection

A Possession_of_property_by_each_member_of_collection is an association between a Property (see 4.2.137) and an object that is a collection, that indicates each member of the collection possesses the Property.

EXAMPLE 190 – The association between the collection of Facilities that consists of valve V1a and valve V1b in annex L and the operating pressure of 15 bar gauge, that indicates each member of the collection has the operating pressure, is a Possession_of_property_by_each_member_of_collection.

A Possession_of_property_by_each_member_of_collection is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Possession_of_property_by_each_member_of_collection shall associate each member of an actual object that is a collection with an actual Property. An intended Possession_of_property_by_each_-member_of_collection may associate each member of either an actual or an intended collection with an actual Property.

An intended Possession_of_property_by_each_member_of_collection that associates an actual collection with an actual Property records an intent to change the existing collection so that each member has the Property.

An intended Possession_of_property_by_each_member_of_collection that associates an intended collection with an actual Property records an intent that each member of the intended collection shall have the Property.

The data associated with a Possession_of_property_by_each_member_of_collection are the following:

– possessed;

– possessor.

4.2.133.1 possessed

The possessed specifies the Property that is possessed by each member of the collected object.

4.2.133.2 possessor

The possessor specifies the object that is the collection of which each member possesses the Property.

The application objects that may be collections and that may possess a Property are as follows:

– Activity;

– Facility;

– Feature;

– Material.

> NOTE 1 – The different application objects that can possess a property are presented in the ARM diagrams by the SELECT TYPE Property_possessing_object.

4.2.134 Possession_of_property_by_object

A Possession_of_property_by_object is an association between a Property (see 4.2.137) and an object that indicates the object possesses the property.

> EXAMPLES
>
> 191 – The association between the V-4506 in annex L and the operating pressure of 15 bar gauge, that indicates the vessel has the operating pressure, is a Possession_of_property_by_object.
>
> 192 – The association between the flange of the inlet nozzle for V-4506 in annex L and 5 bolt holes, that indicates the flange has the number of holes, is a Possession_of_property_by_object.
>
> 193 – The association between the collection of bolts used to make the connection between the flange of the inlet nozzle for V-4506 and the flange at the end of Piping_segment S12 in annex L and 5 members, that indicates the collection has the number of members, is a Possession_of_property_by_object.
>
> 194 – The association between the reducer R1a in annex L and the larger end nominal diameter of 2 inches, that indicates the reducer has the larger end nominal diameter, is a Possession_of_property_by_object.

A Possession_of_property_by_object is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Possession_of_property_by_object shall associate an actual object with an actual Property. An intended Possession_of_property_by_object may associate either an actual or an intended object with an actual Property.

An intended Possession_of_property_by_object that associates an actual object with an actual Property records an intent to change the existing object so that it has the Property.

An intended Possession_of_property_by_object that associates an intended object with an actual Property records an intent that the object shall have the Property.

The data associated with a Possession_of_property_by_object are the following:

– possessed;

– possessor.

4.2.134.1 possessed

The possessed specifies the Property that is possessed.

4.2.134.2 possessor

The possessor specifies the object that possesses the Property.

The application objects that may possess a Property are as follows:

– Activity;

– Facility;

– Feature;

– Material.

> NOTE 1 – The different application objects that can possess a property are presented in the ARM diagrams by the SELECT TYPE Property_possessing_object.

4.2.135 Presentation_of_object_by_annotation_element

A Presentation_of_object_by_annotation_element is an association between a presented object and an Annotation_element (see 4.2.12) that indicates the Annotation_element presents information about the object to a person.

> NOTE 1 – An Annotation_element can present only the existence of the presented object. The form of the Annotation_element can also present the class of the presented object.
>
> The relative placement of Annotation_elements can present information about the composition and connectivity of the presented objects.
>
> An Annotation_element can present Information_content (see 4.2.98) such as Text (see 4.2.171) so that it can be understood by a person.

The data associated with a Presentation_of_object_by_annotation_element are the following:

– presented;

– presenter.

4.2.135.1 presented

The presented specifies the object that is presented.

The application objects that may be presented are as follows:

– Activity;

– Beginning_or_end_effect;

– Connection_of_facility;

– Connection_of_material;

– Facility;

– Feature;

– Information_content.

> NOTE 1 – The different application objects that can be presented by an Annotation_element are presented in the ARM diagrams by the SELECT TYPE Presented_object.

4.2.135.2 presenter

The presenter specifies the Annotation_element that presents the object.

4.2.136 Process_material

A Process_material is a type of Material (see 4.2.110) that is transformed or transferred by a process plant or one or more of its Facility objects.

> NOTES
>
> 1 – The matter that makes up a Process_material can at some stage cease to be a Process_material and become something else. Such a transformation is outside the scope of this part of ISO 10303.
>
> 2 – A Process_material can be static within a vessel, or it can be moving along a pipeline or through a nozzle.
>
> EXAMPLES
>
> 195 – A steel billet in a steel works is a Process_material. The same matter, when forged into a pressure vessel, can be a Material in a oil refinery. In the oil refinery the pressure vessel is not a Process_material.
>
> 196 – The fluid that flows into vessel V-4506 in annex L is a Process_material.
>
> 197 – The fluid that is contained by vessel V-4506 in annex L is a Process_material.

A Process_material is either:

– a Typical_object (see 4.2.178) that describes a generic Material that may be processed by a generic Activity; or

– a Specific_object (see 4.2.168) that is a particular intended or actual batch.

NOTE 3 – A Process_material that is part of the design conditions for an Facility or Material plant item is usually a Typical_object.

Such a typical Process_material is sometimes called a 'stream design case'.

EXAMPLE 198 – The Normal_operating_pressure (see annex M, instance 1261) of 12 bar gauge possessed by my_stream_design_case indicates that that the Process_material has that pressure when the process plant is in normal operation.

NOTE 4 – A Facility or Material plant item is associated with a Process_material through an Activity, as follows:

– a Facility or Material is associated with an Activity by an instance of Involvement_of_object_in_activity (see 4.2.103) that is classified as Performer (see annex M, instance 537);

– a Process_material is associated with the same Activity by an instance of Involvement_of_object_in_activity (see 4.2.103) that is classified as Input_material (see annex M, instance 533) or Output_material (see annex M, instance 536).

The Activity that makes the link is classified as Transfer_material (see annex M, instance 3), Transform_material (see annex M, instance 4) or both.

4.2.137 Property

A Property is an aspect of a thing in the real world that can be observed or measured.

NOTES

1 – A Property of an intended thing can be deemed as part of the design process.

2 – Different measurements can give different values for the same Property.

3 – The aspect of a thing that is its overall shape is not within the scope of this part of ISO 10303. However individual dimensions are Property objects that are within the scope of this part of ISO 10303.

4 – A Property can be classified by association with a Class_of_property (see 4.2.31).

5 – A value for a Property is an Information_content (see 4.2.98), that is assigned to a Property by a Description_of_information_content (see 4.2.79).

EXAMPLES

199 – An operating pressure of 15 bar gauge, that is possessed by vessel V-4506 in annex L, is a Property.

200 – 5 bolt holes, that is possessed by the flange of the inlet nozzle for V-4506 in annex L, is a Property.

201 – 5 members, that is possessed by the collection of bolts used to make the connection between the flange of the inlet nozzle for V-4506 and the flange at the end of Piping_segment S12 in annex L, is a Property.

202 – A larger end nominal diameter of 2 inches, that is possessed by the reducer R1a in annex L, is a Property.

A Property can be possessed by more than one object.

EXAMPLE 203 – Two Material objects that are in thermal equilibrium have the same temperature Property.

4.2.138   Property_basis_for_class_membership

A Property_basis_for_class_membership is an association between a class and a Property (see 4.2.137) that indicates an object is a member of the class only if it possesses the Property.

NOTES

1 – A Property that is the basis for membership of a class is usually a range.

2 – No standard instances of Property_basis_for_class_membership are defined by this part of ISO 10303.

EXAMPLE 204 – The association between the Property design temperature limit greater that 500 degrees C, and the Class_of_material high_temperature_part, that indicates a Material object is classified as a high_temperature_part only if it has a design temperature limit greater that 500 degrees C, is a Property_basis_for_class_membership.

The data associated with a Property_basis_for_class_membership are the following:

– basis;

– class.

4.2.138.1   possessed

The basis specifies the Property that is a basis for membership of the class.

4.2.138.2   possessor

The possessor specifies the class that has the Property as a basis for membership.

The classes that may have a Property_basis_for_class_membership are as follows:

– Class_of_activity;

– Class_of_facility;

– Class_of_material.

NOTE 1 – The different classes that can have a Property_basis_for_class_membership are presented in the ARM diagrams by the SELECT TYPE Property_possessing_class_of_object.

4.2.139 Provision_of_service_by_material

A Provision_of_service_by_material is an association between a Material object (see 4.2.110) and a Facility (see 4.2.89) that indicates the Material is, or is intended to be, the resource that provides the Facility.

NOTES

1 – A single Material object, such as a distributed control system controller, can be a resource that provides many different Facility objects. In this case the controller participates in many different control loops.

2 – A single Facility, such as a pipeline, can be a service that is provided by many different Material objects. In this case the service is provided by pumps, instruments and many piping components.

EXAMPLE 205 – In annex L, the heat exchanger with tag E-4507 is an intended Facility. Process information about the intended duty of the heat exchanger and its functional connectivity is recorded by associations with the intended Facility.

A specific physical component is designed or selected to perform the service with tag E-4507. This is the intended Material designated E-4507-prop3. Information specific to the design of the specific physical component is recorded by associations with the intended Material.

The association between the intended Facility E-4507 and the intended Material E-4507-prop3, that indicates the intended Material provides the service for the intended Facility, is a Provision_of_service_by_resource.

NOTE 3 – During the operation of a process plant, different Material objects can provide the same Facility at different times. Each provision of service has a Beginning_effect (see 4.2.20) and (ultimately) an End_effect (see 4.2.86).

A Provision_of_service_by_material is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Provision_of_service_by_material shall associate an actual Facility with an actual Material. An intended Provision_of_service_by_material may associate either an actual or an intended Facility with either an actual or an intended Material object.

NOTE 4 – The intent for a provision of service can be recorded between:

– a Facility and a Material object, that both exist;

In this case, an intent to replace an existing Material object that currently provides the service by a a different existing Material object is recorded.

– a Facility that exists and an intended Material object;

In this case, an intent to replace an existing Material object that currently provides the service by a intended Material object is recorded.

– an intended Facility and a Material object that exists;

In this case, an intent to provide an intended Facility by a Material object that already exists is recorded.

– an intended Facility and an intended Material object.

In this case, an intent to provide an intended Facility by an intended Material object is recorded.

The data associated with a Provision_of_service_by_material are the following:

– resource;

– service.

4.2.139.1   resource

The resource specifies the Material that is, or is intended to be, the resource for the Facility.

4.2.139.2   service

The service specifies the Facility that is, or is intended to be, the service provided by the Material.

4.2.140   Realization_of_intended_object_by_actual

A Realization_of_intended_object_by_actual is an association between an Intended_object (see 4.2.101) and an Actual_object (see 4.2.8) that indicates the Actual_object is a realisation of the Intended_object, where the realisation may be:

– the satisfaction of a requirement;

– the result of a plan; or

– the coming to pass of an expectation.

> NOTE 1 – The association does not indicate that the Actual_object satisfies the requirement, is consistent with the plan, or is what was expected. The association merely links the requirement, plan or expectation to what came to pass.

> EXAMPLE 206 – In annex L, the heat exchanger with tag E-4507 is an intended Facility. Process information about the intended duty of the heat exchanger and its functional connectivity is recorded by associations with the intended Facility.

> A specific physical component is designed or selected to perform the service with tag E-4507. This is the intended Material designated E-4507-prop3. Information specific to the design of the specific physical component is recorded by associations with the intended Material object.

> The shell and tube heat exchanger manufactured by J. Bloggs and Co. and delivered to the Much Binding refinery to be installed as E-4507, is an actual Material object. Information about the delivered shell and tube heat exchanger that is obtained by measurement is recorded by associations with the actual Material object.

> The association between the shell and tube heat exchanger actually delivered and the intended Material object designated E-4507-prop3, that indicates the actual Material is a result of the intention, is a Realization_of_-intended_object_by_actual.

The data associated with a Realization_of_intended_object_by_actual are the following:

– actual;

– intended.

4.2.140.1 actual

The actual specifies the Actual object that is a realisation of the Intended object.

4.2.140.2 intended

The intended specifies the Intended object that is realised by the Actual object.

4.2.141 Recognized_assembly_of_annotation_element_according_to_class

A Recognized assembly of annotation element according to class is an association between two Class of annotation element objects (see 4.2.25) (part and whole) that indicates an Annotation element within the part class is recognized to be potentially a valid part of an Annotation element within the whole class.

An Assembly of annotation element (see 4.2.17) such that there is a Recognized assembly of annotation element according to class association between the class of the whole Annotation element (see 4.2.12) and the class of the part Annotation element, is recognized to be potentially valid.

> NOTES
>
> 1 – An Assembly of annotation element that is recognized to be potentially valid need not be valid. An Assembly of annotation element that is not recognized to be potentially valid can be valid.
>
> 2 – An application program can check for Assembly of annotation element associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.
>
> 3 – A potentially valid assembly can be recognized between two Annotation elements of the same class or of different classes.
>
> 4 – Standard instances of Recognized assembly of annotation element according to class are not defined by this part of ISO 10303. Instances can be defined by a user.
>
> EXAMPLE 207 – The association between the Class of annotation element valve symbol and the Class of annotation element ball valve symbol, that indicates a valve symbol is recognized to be potentially a valid part of a ball valve symbol, is a Recognized assembly of annotation element according to class.
>
> This is shown in figure 18.
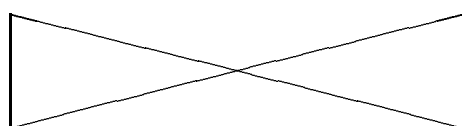
The data associated with a Recognized assembly of annotation element according to class are the following:
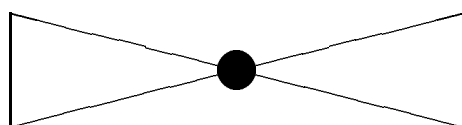
– part;

– whole.

4.2.141.1 part

The part specifies the Class of annotation element such that a member is potentially a valid part.

valve_symbol (part)

ball_valve_symbol (whole)

Figure 18 – Assembly of a ball_valve_symbol

4.2.141.2 whole

The whole specifies the Class_of_annotation_element such that a member is potentially a valid whole.

4.2.142 Recognized_assembly_of_facility_according_to_class

A Recognized_assembly_of_facility_according_to_class is an association between two Class_of_facility objects (see 4.2.26) (part and whole) that indicates a Facility within the part class is recognized to be potentially a valid part of a Facility within the whole class.

An Assembly_of_facility (see 4.2.18) such that there is a Recognized_assembly_of_facility_according_-to_class association between the class of the whole Facility (see 4.2.89) and the class of the part Facility, is recognized to be potentially valid.

> NOTES
>
> 1 – An Assembly_of_facility that is recognized to be potentially valid, need not be valid. An Assembly_of_-facility that is not recognized to be potentially valid, can be valid.
>
> 2 – An application program can check for Assembly_of_facility associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.
>
> 3 – A potentially valid assembly can be recognized between two Facility objects of the same class or of different classes.
>
> 4 – Standard instances of Recognized_assembly_of_facility_according_to_class are not defined by this part of ISO 10303. Instances can be defined by a user.
>
> EXAMPLE 208 – The association between the Class_of_facility pipe_line and the Class_of_facility control_-valve that indicates a control_valve is potentially a valid part of a pipe_line is a Recognized_assembly_of_-facility_according_to_class.

The data associated with a Recognized_assembly_of_facility_according_to_class are the following:

– part;

– whole.

4.2.142.1 part

The part specifies the Class_of_facility such that a member is potentially a valid part.

4.2.142.2 whole

The whole specifies the Class_of_facility such that a member is potentially a valid whole.

4.2.143   Recognized_assembly_of_material_according_to_class

A Recognized_assembly_of_material_according_to_class is an association between two Class_of_material objects (see 4.2.30) (part and whole) that indicates a Material object within the part class is recognized to be potentially a valid part of a Material object within the whole class.

An Assembly_of_material (see 4.2.19) such that there is a Recognized_assembly_of_material_according_-to_class association between the class of the whole Material (see 4.2.110) and the class of the part Material, is recognized to be potentially valid.

> NOTES
>
> 1 – An Assembly_of_material that is recognized to be potentially valid, need not be valid. An Assembly_of_-material that is not recognized to be potentially valid, can be valid.
>
> 2 – An application program can check for Assembly_of_material associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.
>
> 3 – A potentially valid assembly can be recognized between two Material objects of the same class or of different classes.
>
> 4 – Standard instances of Recognized_assembly_of_material_according_to_class are not defined by this part of ISO 10303. Instances can be defined by a user.
>
> EXAMPLE 209 – The association between the Class_of_material centrifugal_pump and the Class_of_material impeller that indicates an impeller is potentially a valid part of a centrifugal_pump is a Recognized_assembly_-of_material_according_to_class.

The data associated with a Recognized_assembly_of_material_according_to_class are the following:

 –   part;

 –   whole.

4.2.143.1   part

The part specifies the Class_of_material such that a member is potentially a valid part.

4.2.143.2   whole

The whole specifies the Class_of_material such that a member is potentially a valid whole.

4.2.144   Recognized_class_of_resource_for_facility

A Recognized_class_of_resource_for_facility is an association between a Facility (see 4.2.89) and a Class_-of_material (see 4.2.30) that indicates a Material object within the class is recognized to be potentially a valid resource for the Facility.

A Provision_of_service_by_material (see 4.2.139) such that there is a Recognized_class_of_resource_for_-facility association between the Facility and the Class_of_material, is recognized to be potentially valid.

NOTES

1 – A Provision_of_service_by_material that is recognized to be potentially valid, need not be valid. A Provision_of_service_by_material that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Provision_of_service_by_material associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

3 – Standard instances of Recognized_class_of_resource_for_facility are not defined by this part of ISO 10303. Instances can be defined by a user.

EXAMPLE 210 – The association between the heat exchange E-4507 in annex L (a Facility) and the Class_-of_material shell_and_tube_heat_exchanger, that indicates a Material object within the class is potentially a valid resource, is a Recognized_class_of_resource_for_facility.

The data associated with a Recognized_class_of_resource_for_facility are the following:

– resource;

– service.

4.2.144.1 resource

The resource specifies the Class_of_material such that a member is potentially a valid resource for the Facility.

4.2.144.2 service

The service specifies the Facility that is the service each member of the Class_of_material is potentially valid to provide.

4.2.145 Recognized_class_of_service_for_material

A Recognized_class_of_service_for_material is an association between a Material object (see 4.2.110) and a Class_of_facility (see 4.2.26) that indicates a Facility within the class is recognized to be potentially a valid service for the Material.

A Provision_of_service_by_material (see 4.2.139) such that there is a Recognized_class_of_service_for_-material association between the Material object and the Class_of_facility, is recognized to be potentially valid.

NOTES

1 – A Provision_of_service_by_material that is recognized to be potentially valid, need not be valid. A Provision_of_service_by_material that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Provision_of_service_by_material associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

3 – Standard instances of Recognized_class_of_service_for_material are not defined by this part of ISO 10303. Instances can be defined by a user.

EXAMPLE 211 – The association between the Material object with asset registration number "JBC/XYZ/12345" and the Class_of_facility heat_exchanger, that indicates the Material object is recognized as being potentially valid to provide a service of the class, is a Recognized_class_of_service_for_material.

The data associated with a Recognized_class_of_service_for_material are the following:

– resource;

– service.

4.2.145.1 resource

The resource specifies the Material object that is potentially a valid resource for a member of the Class_of_facility.

4.2.145.2 service

The service specifies the Class_of_facility such that a member is potentially a valid service for the Material object.

4.2.146 Recognized_composition_of_information_content_according_to_class

A Recognized_composition_of_information_content_according_to_class is an association between two Class_of_information_content objects (see 4.2.27) (part and whole) that indicates an Information_content within the part class is recognized to be potentially a valid part of an Information_content within the whole class.

A Composition_of_information_content (see 4.2.61) such that there is a Recognized_composition_of_information_content_according_to_class association between the class of the whole Information_content (see 4.2.98) and the class of the part Information_content, is recognized to be potentially valid.

NOTES

1 – A Composition_of_information_content that is recognized to be potentially valid, need not be valid. A Composition_of_information_content that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Composition_of_information_content associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

3 – A potentially valid assembly can be recognized between two Information_contents of the same class or of different classes.

4 – Standard instances of Recognized_composition_of_information_content_according_to_class are not defined by this part of ISO 10303. Instances can be defined by a user.

EXAMPLE 212 – The association between the Class_of_information_content piping_class and the Class_of_information_content design_limits, that indicates design_limits are recognized to be potentially a valid component of a piping_class, is a Recognized_composition_of_information_content_according_to_class.

The data associated with a Recognized_composition_of_information_content_according_to_class are the following:

– part;

– whole.

4.2.146.1 part

The part specifies the Class_of_information_content such that a member is potentially a valid part.

4.2.146.2 whole

The whole specifies the Class_of_information_content such that a member is potentially a valid whole.

4.2.147 Recognized_connection_of_annotation_element_according_to_class

A Recognized_connection_of_annotation_element_according_to_class is an association between two Class_of_annotation_element objects (see 4.2.25) that indicates an Annotation_element within one class is recognized to have a potentially valid connection with an Annotation_element within the other class.

A Connection_of_annotation_element (see 4.2.64) such that there is a Recognized_connection_of_annotation_element_according_to_class association between the classes of the Annotation_elements (see 4.2.12), is recognized to be potentially valid.

NOTES

1 – A Connection_of_annotation_element that is recognized to be potentially valid, need not be valid. A Connection_of_annotation_element that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Connection_of_annotation_element associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

3 – A potentially valid connection can be recognized between two Annotation_elements of the same class or of different classes.

4 – Standard instances of Recognized_connection_of_annotation_element_according_to_class are not defined by this part of ISO 10303. Instances can be defined by a user.

EXAMPLE 213 – The association between Class_of_annotation_element valve_connect_point and Class_of_annotation_element line_segment, that indicates each valve_connect_point is recognized to have a potentially

valid connection with each line_segment, is a Recognized_connection_of_annotation_element_according_to_-
class.

The data associated with a Recognized_connection_of_annotation_element_according_to_class are the fol-
lowing:

– side_1;

– side_2.

> NOTE 5 – There is no significance to the assignment of a Class_of_annotation_element to side_1 or side_2.

4.2.147.1   side_1

The side_1 specifies the Class_of_annotation_element such that a member has a potentially valid connec-
tion with a member of the side_2 Class_of_annotation_element.

4.2.147.2   side_2

The side_2 specifies the Class_of_annotation_element such that a member has a potentially valid connec-
tion with a member of the side_1 Class_of_annotation_element.

4.2.148   Recognized_connection_of_facility_according_to_class

A Recognized_connection_of_facility_according_to_class is an association between two Class_of_facility
objects (see 4.2.26) that indicates a Facility within one class is recognized to have a potentially valid
connection with a Facility within the other class.

A Connection_of_facility (see 4.2.65) such that there is a Recognized_connection_of_facility_according_-
to_class association between the classes of the Facility objects (see 4.2.89), is recognized to be potentially
valid.

> NOTES
>
> 1 – A Connection_of_facility that is recognized to be potentially valid need not be valid. A Connection_of_-
> facility that is not recognized to be potentially valid can be valid.
>
> 2 – An application program can check for Connection_of_facility associations that are not recognized to
> be valid and issue warning messages, but the operation of such a program is not specified by this part of
> ISO 10303.
>
> 3 – A potentially valid connection can be recognized between two Facility objects of the same class or of
> different classes.
>
> 4 – Standard instances of Recognized_connection_of_facility_according_to_class are not defined by this part
> of ISO 10303. Instances can be defined by a user.
>
> EXAMPLES

214 – The association between the Class_of_facility Piping_segment (see annex M, instance 266) and the Class_of_facility Fluid_port (see annex M, instance 24), that indicates each Piping_segment is recognized to have a potentially valid connection with a Fluid_port, is a Recognized_connection_of_facility_according_to_class.

215 – The association between the Class_of_facility Piping_segment and itself, that indicates a Piping_segment is recognized to have a potentially valid connection with another Piping_segment, is a Recognized_connection_of_facility_according_to_class.

The data associated with a Recognized_connection_of_facility_according_to_class are the following:

– side_1;

– side_2.

NOTE 5 – There is no significance to the assignment of a Class_of_facility to side_1 or side_2.

4.2.148.1 side_1

The side_1 specifies the Class_of_facility such that a member has a potentially valid connection with a member of the side_2 Class_of_facility.

4.2.148.2 side_2

The side_2 specifies the Class_of_facility such that a member has a potentially valid connection with a member of the side_1 Class_of_facility.

4.2.149 Recognized_connection_of_material_according_to_class

A Recognized_connection_of_material_according_to_class is an association between two Class_of_material objects (see 4.2.30) that indicates a Material object within one class is recognized to have a potentially valid connection with a Material object within the other class.

A Connection_of_material (see 4.2.66) such that there is a Recognized_connection_of_material_according_-to_class association between the classes of the Material objects (see 4.2.110), is recognized to be potentially valid.

NOTES

1 – A Connection_of_material that is recognized to be potentially valid, need not be valid. A Connection_-of_material that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Connection_of_material associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

3 – A potentially valid connection can be recognized between two Material objects of the same class or of different classes.

4 – Standard instances of Recognized_connection_of_material_according_to_class are not defined by this part of ISO 10303. Instances can be defined by a user.

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216 – The association between the Class_of_material flange and the Class_of_material gasket, that indicates a flange is recognized to have a potentially valid connection with a gasket, is a Recognized_connection_of_-material_according_to_class.

217 – The association between the Class_of_material flange and itself, that indicates a flange has a potentially valid connection with another flange, is a Recognized_connection_of_material_according_to_class.

The data associated with a Recognized_connection_of_material_according_to_class are the following:

– side_1;

– side_2.

NOTE 5 – There is no significance to the assignment of a Class_of_material to side_1 or side_2.

4.2.149.1   side_1

The side_1 specifies the Class_of_material such that each member has a potentially valid connection with a member of the side_2 Class_of_material.

4.2.149.2   side_2

The side_2 specifies the Class_of_material such that a member has a potentially valid connection with each member of the side_1 Class_of_material.

4.2.150   Recognized_description_of_object_according_to_class

A Recognized_description_of_object_according_to_class is an association between a Class_of_information_-content (see 4.2.27) and a class, that indicates a description of a member of the class by an Information_-content of the Class_of_information_content is recognised to be potentially valid.

A Description_of_object_by_information_content (see 4.2.79) such that there is a Recognized_description_-of_object_according_to_class association between the class of the described object and the class of the Information_content (see 4.2.98), is recognized to be potentially valid.

NOTES

1 – A Description_of_object_by_information_content that is recognized to be potentially valid, need not be valid. A Description_of_object_by_information_content that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Description_of_object_by_information_content associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

3 – Standard instances of Recognized_description_of_object_according_to_class are not defined by this part of ISO 10303. Instances can be defined by a user.

EXAMPLES

218 – The association between the Class_of_facility pipe_line and the Class_of_information_content piping_specification, that indicates a piping_specification is potentially a valid description of a pipe_line, is a Recognized_description_of_object_according_to_class.

219 – The association between the Class_of_facility heat_exchanger and the Class_of_information_content heat_exchanger_process_data_sheet, that indicates a heat_exchanger_process_data_sheet is potentially a valid description of a heat_exchanger, is a Recognized_description_of_object_according_to_class.

220 – The association between the Class_of_material centrifugal_pump and the Class_of_information_content centrifugal_pump_mechanical_data_sheet, that indicates a centrifugal_pump_mechanical_data_sheet is potentially a valid description of a centrifugal_pump, is a Recognized_description_of_object_according_to_class.

221 – The association between the Class_of_material pressure_vessel and the Class_of_information_content pressure_test_certificate, that indicates a pressure_test_certificate is potentially a valid description of a pressure_vessel, is a Recognized_description_of_object_according_to_class.

The data associated with a Recognized_description_of_object_according_to_class are the following:

– described;

– describing.

4.2.150.1   described

The described specifies the class such that a member has a potentially valid description given by a member of the Class_of_information_content.

The classes that may have a Recognized_description_of_object_according_to_class are as follows:

– Class_of_activity;

– Class_of_facility;

– Class_of_material.

NOTE 1 – The different classes that can have a Recognized_description_of_object_according_to_class are presented in the ARM diagrams by the SELECT TYPE Described_class_of_object.

4.2.150.2   describing

The describing specifies the Class_of_information_content such that a member is a potentially valid description of a member of the described class.

4.2.151   Recognized_involvement_for_activity_according_to_class

A Recognized_involvement_for_activity_according_to_class is an association between a Class_of_activity (see 4.2.24) and a Class_of_involvement (see 4.2.29) that indicates:

– for an Activity (see 4.2.7) of the class;

– an Involvement_of_object_in_activity (see 4.2.103) of the class is recognized to be potentially valid.

An Involvement_of_object_in_activity such that there is a Recognized_involvement_for_activity_according_-to_class association between the class of the Activity and the class of the Involvement_of_object_in_-activity is recognized to be potentially valid.

> NOTES
>
> 1 – An Involvement_of_object_in_activity that is recognized to be potentially valid, need not be valid. An Involvement_of_object_in_activity that is not recognized to be potentially valid, can be valid.
>
> 2 – The associations:
>
> – Recognized_involvement_in_activity_for_object_according_to_class (see 4.2.152); and
>
> – Recognized_object_for_role_according_to_class (see 4.2.153),
>
> are also indications of the potential validity of an Involvement_of_object_in_activity.
>
> 3 – An application program can check for Involvement_of_object_in_activity associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.
>
> 4 – Standard instances of Recognized_involvement_for_activity_according_to_class are defined by this part of ISO 10303. Further instances can be defined by a user.

The standard instances of Recognized_involvement_for_activity_according_to_class are defined in M.10.

> EXAMPLES
>
> 222 – The association between the Class_of_activity transfer_steam and the Class_of_involvement flow_-indicator, that indicates an involvement of flow_indicator is potentially valid for a transfer_steam Activity, is a Recognized_involvement_for_activity_according_to_class.
>
> 223 – The association between the Class_of_activity produce_stress_report and the Class_of_involvement high_temperature_materials_adviser, that indicates an involvement of high_temperature_materials_adviser is potentially valid for a produce_stress_report Activity, is a Recognized_involvement_for_activity_according_-to_class.

The data associated with a Recognized_involvement_for_activity_according_to_class are the following:

– activity;

– involvement.

4.2.151.1 activity

The activity specifies the Class_of_activity such that a member has a potentially valid involvement of the Class_of_involvement.

4.2.151.2 involvement

The involvement specifies the Class_of_involvement such that a member is potentially valid for a member of the Class_of_activity.

4.2.152 Recognized_involvement_in_activity_for_object_according_to_class

A Recognized_involvement_in_activity_for_object_according_to_class is an association between a Recognized_involvement_for_activity_according_to_class (see 4.2.151) and a class of involved object that indicates:

– a member of the class of involved object is potentially a valid involved object in an Involvement_of_object_in_activity (see 4.2.103);

– provided that the Class_of_involvement (see 4.2.29) and the Class_of_activity (see 4.2.24) are associated by the Recognized_involvement_for_activity_according_to_class.

An Involvement_of_object_in_activity such that there is a Recognized_involvement_in_activity_for_object_according_to_class association between the:

– Recognized_involvement_for_activity_according_to_class association between the Class_of_activity and the Class_of_involvement; and

– the class of the involved object,

is recognized to be potentially valid.

  NOTES

  1 – An Involvement_of_object_in_activity that is recognized to be potentially valid, need not be valid. An Involvement_of_object_in_activity that is not recognized to be potentially valid, can be valid.

  2 – The associations:

   – Recognized_involvement_for_activity_according_to_class (see 4.2.151); and

   – Recognized_object_for_role_according_to_class (see 4.2.153),

  are also indications of the potential validity of an Involvement_of_object_in_activity.

  3 – An application program can check for Involvement_of_object_in_activity associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

4 – No standard instances of Recognized_involvement_in_activity_for_object_according_to_class are defined by this part of ISO 10303. Instances can be defined by a user.

EXAMPLE 224 – The association between:

- the Recognized_involvement_for_activity_according_to_class that indicates an involvement of flow_indicator is potentially valid for a transfer_steam Activity; and

- the Class_of_material differential_pressure_vapour_flow_measuring_device;

that indicates a Material object of the class is potentially valid to have an involvement in the Activity as flow_indicator, is a Recognized_involvement_in_activity_for_object_according_to_class.

The data associated with a Recognized_involvement_in_activity_for_object_according_to_class are the following:

- player;

- role_in_activity.

4.2.152.1   player

The player specifies the class of involved object such that a member is potentially valid for an Involvement_of_object_in_activity indicated to be potentially valid by the role_in_activity.

The class may be either a Class_of_Facility (see 4.2.26) or a Class_of_material (see 4.2.30).

NOTE 1 – The different application objects that can be the class of involved object are presented in the ARM diagrams by the SELECT TYPE Involved_class_of_object.

4.2.152.2   role_in_activity

The role_in_activity specifies the Recognized_involvement_for_activity_according_to_class that indicates the instances of Involvement_of_object_in_activity for which a member of the class of involved object is potentially valid.

4.2.153   Recognized_object_for_role_according_to_class

A Recognized_object_for_role_according_to_class is an association between a Class_of_involvement (see 4.2.29) and a class of involved object that indicates:

- a member of the class of involved object is potentially a valid involved object in an Involvement_of_object_in_activity (see 4.2.103);

- provided that the Involvement_of_object_in_activity is of the Class_of_involvement.

An Involvement_of_object_in_activity such that there is a Recognized_object_for_role_according_to_class association between the class of the Involvement_of_object_in_activity and the class of the involved object is recognized to be potentially valid.

NOTES

1 – An Involvement_of_object_in_activity that is recognized to be potentially valid, need not be valid. An Involvement_of_object_in_activity that is not recognized to be potentially valid, can be valid.

2 – The associations:

– Recognized_involvement_for_activity_according_to_class (see 4.2.151); and

– Recognized_involvement_in_activity_for_object_according_to_class (see 4.2.152),

are also indications of the potential validity of an Involvement_of_object_in_activity.

3 – An application program can check for Involvement_of_object_in_activity associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.

4 – No standard instances of Recognized_object_for_role_according_to_class are defined by this part of ISO 10303. Instances can be defined by a user.

EXAMPLE 225 – The association between the Class_of_involvement performer and the Class_of_Facility pipeline, that indicates a pipeline Facility is potentially a valid performer (in an Activity such as a transfer_-material), is a Recognized_object_for_role_according_to_class.

The data associated with a Recognized_object_for_role_according_to_class are the following:

– player;

– role.

4.2.153.1   player

The player specifies the class if involved object such that each member is potentially valid for an Involvement_of_object_in_activity of the Class_of_involvement.

The class may be either a Class_of_Facility (see 4.2.26) or a Class_of_material (see 4.2.30).

NOTE 1 – The different application objects that can be the class of involved object are presented in the ARM diagrams by the SELECT TYPE Involved_class_of_object.

4.2.153.2   role

The role specifies the Class_of_involvement such that each member is potentially valid as a role for each member of the class of involved object.

4.2.154   Recognized_possession_of_property_according_to_class

A Recognized_possession_of_property_according_to_class is an association between a Class_of_property (see 4.2.31) and a class of possessor that indicates a member of the class of possessor is recognised to be potentially a valid possessor of a Property of the Class_of_property.

A Possession_of_property_by_object (see 4.2.134) such that there is a Recognized_possession_of_property_-
according_to_class association between the class of the possessor and the class of the Property (see 4.2.137),
is recognized to be potentially valid.

NOTES

1 – A Possession_of_property_by_object that is recognized to be potentially valid, need not be valid. A
Possession_of_property_by_object that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Possession_of_property_by_object associations that are not recog-
nized to be valid and issue warning messages, but the operation of such a program is not specified by this part
of ISO 10303.

3 – Standard instances of Recognized_possession_of_property_according_to_class are not defined by this part
of ISO 10303.

EXAMPLE 226 – The association between the Class_of_Facility Piping_segment and the Class_of_property
normal_operating_pressure, that indicates a Piping_segment is potentially a valid possessor of a normal_-
operating_pressure, is a Recognized_possession_of_property_according_to_class.

The data associated with a Recognized_possession_of_property_according_to_class are the following:

– possessed;

– possessor.

4.2.154.1   possessed

The possessed specifies the Class_of_property such that the possession of a member by a member of the
class of possessor is potentially valid.

4.2.154.2   possessor

The possessor specifies the class of possessor such that a member is potentially a valid possessor of a
Property within the Class_of_property.

The classes that may have a Recognized_possession_of_property_according_to_class are as follows:

– Class_of_activity;

– Class_of_facility;

– Class_of_material.

NOTE 1 – The different classes that can have a Recognized_possession_of_property_according_to_class are
presented in the ARM diagrams by the SELECT TYPE Property_possessing_class_of_object.

4.2.155 Recognized_presentation_of_facility_by_annotation_element_according_-to_class

A Recognized_presentation_of_facility_by_annotation_element_according_to_class is an association between a Class_of_facility (see 4.2.26) and a Class_of_annotation_element (see 4.2.25) that indicates an Annotation_element of the class is recognized to be potentially a valid presenter of a Facility of the class.

A Presentation_of_object_by_annotation_element (see 4.2.135) such that there is a Recognized_presentation_-of_facility_by_annotation_element_according_to_class association between the class of the Annotation_-element (see 4.2.12) and the class of the presented object is recognized to be potentially valid.

> NOTES
>
> 1 – A Presentation_of_object_by_annotation_element that is recognized to be potentially valid, need not be valid. A Presentation_of_object_by_annotation_element that is not recognized to be potentially valid, can be valid.
>
> 2 – An application program can check for Presentation_of_object_by_annotation_element associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.
>
> 3 – Standard instances of Recognized_presentation_of_facility_by_annotation_element_according_to_class are not defined by this part of ISO 10303.
>
> EXAMPLE 227 – The association between the Class_of_facility valve and the Class_of_annotation_element valve_symbol, that indicates an Annotation_element of the class is potentially a valid presenter for a Facility of the class, is a Recognized_presentation_of_facility_by_annotation_element_according_to_class.

The data associated with a Recognized_presentation_of_facility_by_annotation_element_according_to_-class are the following:

– presented;

– presenter.

4.2.155.1 presented

The presented specifies the Class_of_facility such that a member has a potentially valid presentation by an Annotation_element within the Class_of_annotation_element.

4.2.155.2 presenter

The presenter specifies the Class_of_annotation_element such that a member is a potentially valid presenter of a Facility within the Class_of_facility.

4.2.156   Recognized_presentation_of_material_by_annotation_element_according_-
to_class

A Recognized_presentation_of_material_by_annotation_element_according_to_class is an association be-
tween a Class_of_material (see 4.2.30) and a Class_of_annotation_element (see 4.2.25) that indicates an
Annotation_element of the class is recognized to be potentially a valid presenter of a Material object of
the class.

A Presentation_of_object_by_annotation_element (see 4.2.135) such that there is a Recognized_presentation_-
of_material_by_annotation_element_according_to_class association between the class of the Annotation_-
element (see 4.2.12) and the class of the presented object is recognized to be potentially valid.

NOTES

1 – A Presentation_of_object_by_annotation_element that is recognized to be potentially valid, need be valid.
A Presentation_of_object_by_annotation_element that is not recognized to be potentially valid, can be valid.

2 – An application program can check for Presentation_of_object_by_annotation_element associations that
are not recognized to be valid and issue warning messages, but the operation of such a program is not specified
by this part of ISO 10303.

3 – Standard instances of Recognized_presentation_of_facility_by_annotation_element_according_to_class are
not defined by this part of ISO 10303.

EXAMPLE 228 – The association between the Class_of_material ball_valve and the Class_of_annotation_-
element ball_valve_symbol, that indicates an Annotation_element of the class is potentially a valid pre-
senter for a Material object of the class, is a Recognized_presentation_of_material_by_annotation_element_-
according_to_class.

The data associated with a Recognized_presentation_of_material_by_annotation_element_according_to_-
class are the following:

– presented;

– presenter.

4.2.156.1   presented

The presented specifies the Class_of_material such that a member has a potentially valid presentation by
an Annotation_element within the Class_of_annotation_element.

4.2.156.2   presenter

The presenter specifies the Class_of_annotation_element such that a member is potentially a valid pre-
senter of a Material object within the Class_of_material.

4.2.157 Recognized_provision_of_service_according_to_class

A Recognized_provision_of_service_according_to_class is an association between a Class_of_facility (see 4.2.26) and a Class_of_material (see 4.2.30) that indicates a Material object within the class is recognized to be potentially a valid resource for a Facility within the class.

A Provision_of_service_by_material (see 4.2.139) such that there is a Recognized_provision_of_service_-according_to_class association between the class of the Facility (see 4.2.89) and the class of the Material object (see 4.2.110), is recognized to be potentially valid.

> NOTES
>
> 1 – A Provision_of_service_by_material that is recognized to be potentially valid, need not be valid. A Provision_of_service_by_material that is not recognized to be potentially valid, can be valid.
>
> 2 – An application program can check for Provision_of_service_by_material associations that are not recognized to be valid and issue warning messages, but the operation of such a program is not specified by this part of ISO 10303.
>
> 3 – Standard instances of Recognized_provision_of_service_according_to_class are not defined by this part of ISO 10303.
>
> EXAMPLE 229 – The association between the Class_of_facility control_valve and the Class_of_material globe_valve that indicates a globe_valve is recognized to be potentially a valid resource for a control_valve, is a Recognized_provision_of_service_according_to_class.

The data associated with a Recognized_provision_of_service_according_to_class are the following:

– resource;

– service

4.2.157.1 resource

The resource specifies the Class_of_material such that a member is potentially a valid resource for a member of the Class_of_facility.

4.2.157.2 service

The service specifies the Class_of_facility such that a member is potentially a valid service for a member of the Class_of_material.

4.2.158 Reference_between_information_carrier

A Reference_between_information_carrier is an association between two information holders (referenced and referencing) that indicates the referencing make a reference to the referenced.

> EXAMPLE 230 – The association between the Physical_information_carrier with name "MBB/SCR/12345: Much Binding B safety case report" and the Physical_information_carrier with name "ESD/DJL/1234: Structural integrity report on Vessel V-4506", that indicates the structural integrity report is referenced by the safety case report, is a Reference_between_information_carrier.

The data associated with a Reference_between_information_carrier are the following:

– referenced;

– referencing.

4.2.158.1   referenced

The referenced specifies the information holder, either a Logical_information_carrier (see 4.2.108) or a Physical_information_content (see 4.2.108). that is referenced.

> NOTE 1 – The different application objects that can be an information holder are presented in the ARM diagrams by the SELECT TYPE Holder.

4.2.158.2   referencing

The referenced specifies the information holder, either a Logical_information_carrier (see 4.2.108) or a Physical_information_content (see 4.2.108). that makes the reference.

> NOTE 1 – The different application objects that can be an information holder are presented in the ARM diagrams by the SELECT TYPE Holder.

4.2.159   Reference_between_page_connector

A Reference_between_page_connector is an association between two Page_connectors (see 4.2.121) that indicates each has a form that can be interpreted by a person as a reference to the other.

The data associated with a Reference_between_page_connector are the following:

– side_1;

– side_2.

The choice of side_1 or side_2 for a referenced Page_connector is arbitrary, so that the same information is recorded whatever the choice.

4.2.159.1   side_1

The side_1 specifies one Page_connector that is referenced.

4.2.159.2   side_2

The side_2 specifies the other Page_connector that is referenced.

4.2.160   Reference_to_object_by_information_content

A Reference_to_object_by_information_content is a type of Description_of_object_by_information_content (see 4.2.79) that indicates the Information_content (see 4.2.98) makes reference to the described object, but is not expected to be a source of understanding about the nature of the object.

EXAMPLE 231 – The association between the Information_content "requires approval in writing from the Nuclear Installation Inspectorate" and the Organization Nuclear Installation Inspectorate, that indicates the Information_content refers to the Organization, is a Reference_to_object_by_information_content.

4.2.161   Reference_to_object_via_information_carrier

A Reference_to_object_via_information_carrier is a type of Description_of_object_via_information_carrier (see 4.2.80) that indicates the information holder contains Information_content that makes reference to the described object, but that is not expected to be a source of understanding about the nature of the object.

EXAMPLE 232 – The association between the Physical_information_carrier that is document MBB/SCR/12345 containing the Much Binding B power station safety case and the Organization Nuclear Installation Inspectorate, that indicates the Physical_information_carrier contains Information_content that refers to the Organization, is a Reference_to_object_via_information_carrier.

4.2.162   Relative_placement_of_annotation_element

A Relative_placement_of_annotation_element is an association between two Annotation_elements (see 4.2.12) that indicates the placed Annotation_element has a position and orientation defined with respect to the referenced Annotation_element.

A Relative_placement_of_annotation_element may be a Leader_terminator_for_annotation_curve (see 4.2.104).

NOTE 1 – A Relative_placement_of_annotation_element can be associated with a 2d_placement (see 4.2.4) by a Description_of_relative_placement (see 4.2.82).

The 2d_placement is a description of the position and orientation of the coordinate system of the placed Annotation_element with respect to the coordinate system of the referenced Annotation_element.

EXAMPLE 233 – The shaded area in figure 19 is two Annotation_elements, that are larger than normal. One is a presentation of a Valve_system (see annex M, instance 466), and the other is a presentation of the tag of the system.

The Annotation_element that is a presentation of the tag is Centre_justified and has coordinate axes denoted x' and y'. The Annotation_element that is a presentation of the Valve_system has coordinate axes denoted x and y.
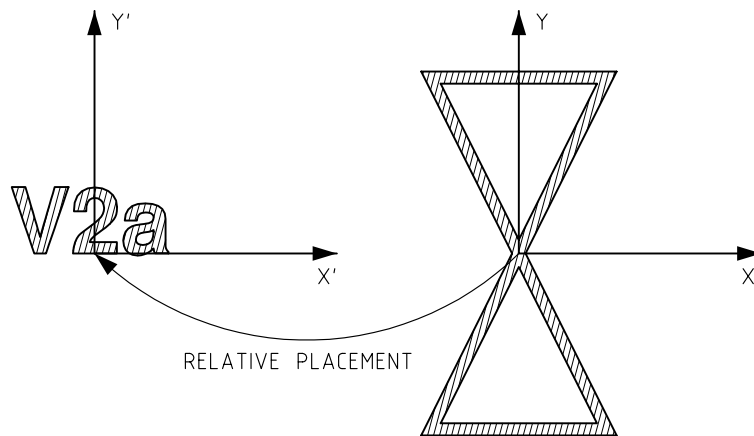
The Annotation_element that is a presentation of the tag is placed relative to the Annotation_element that is a presentation of the Valve_system.

The data associated with a Relative_placement_of_annotation_element are the following:

– placed;

– referenced.

4.2.162.1   placed

The placed specifies the Annotation_element that has its position and orientation defined.

Figure 19 – Annotation_elements that have relative placement

4.2.162.2   referenced

The referenced specifies the Annotation_element that the position and orientation of the placed Annotation_element is defined with respect to.

4.2.163   Required_input_description_according_to_class

A Required_input_description_according_to_class is an association between a Recognized_description_-of_object_according_to_class (see 4.2.150) and a purpose that indicates:

–   for a described object of the class that is associated by the Recognized_description_of_object_-according_to_class with the Class_of_information_content (see 4.2.27);

–   as input to the Activity that is the purpose, or as input to an Activity of the class that is the purpose;

–   a Description_of_object_by_information_content (see 4.2.79) association with an Information_content (see 4.2.98) of the class is required.

NOTE 1 – A Required_input_description_according_to_class is information about the user requirement. The association does not ensure that a description is recorded.

An application program can check for required descriptions that are not recorded and for descriptions that are not required, but the operation of such a program is not specified by this part of ISO 10303.

EXAMPLE 234 – The association between:

–   the Recognized_description_of_object_according_to_class that indicates an Information_content of the class heat_exchanger_process_data_sheet is a recognized description of a Facility of the class heat_-exchanger; and

   – the Class_of_activity detailed_engineering_design,

that indicates a heat_exchanger_data_sheet is required for a heat_exchanger on input to a detailed_engineering_design activity is a Required_input_description_according_to_class.

The data associated with a Required_input_description_according_to_class are the following:

– purpose;

– requirement.

4.2.163.1 purpose

The purpose specifies the Activity or Class_of_activity for which the description is required on input.

> NOTE 1 – The different application objects that can be the purpose for which a description is required on input are presented in the ARM diagrams by the SELECT TYPE Purpose.

4.2.163.2 requirement

The requirement specifies the Recognized_description_of_object_according_to_class that is required.

4.2.164 Required_input_of_property_value_according_to_class

A Required_input_of_property_value_according_to_class is an association between a Recognized_possession_of_property_according_to_class (see 4.2.154), a purpose and optionally a Unit_of_measure (see 4.2.179) that indicates:

– for an object of the class that is associated by the Recognized_possession_of_property_according_to_class with the Class_of_property (see 4.2.31);

– as input to the Activity that is the purpose, or as input to an Activity of the class that is the purpose;

– a Possession_of_property_by_object (see 4.2.134) association with a Property of the class is required;

– that Property is required to possess a Numeric_value;

– if a Unit_of_measure is specified, then that Numeric_value is required to have the specified Unit_of_measure.

> NOTE 1 – A Required_input_of_property_value_according_to_class is information about the user requirement. The association does not ensure that a value is recorded.

An application program can check for required values that are not recorded and for values that are not required, but the operation of such a program is not specified by this part of ISO 10303.

EXAMPLE 235 – The association between:

   – the Recognized_possession_of_property_according_to_class that indicates a Property of the class operating_pressure is a recognized Property of a Facility of the class heat_exchanger; and

– the Class_of_activity detailed_engineering_design,

that indicates an operating_pressure value is required for a heat_exchanger on input to a detailed_engineering_-
design activity is a Required_input_of_property_value_according_to_class.

The data associated with a Required_input_of_property_value_according_to_class are the following:

– purpose;

– requirement;

– units.

4.2.164.1   purpose

The purpose specifies the Activity or Class_of_activity for which the value is required on input.

> NOTE 1 –   The different application objects that can be the purpose for which a value is required on input
> are presented in the ARM diagrams by the SELECT TYPE Purpose.

4.2.164.2   requirement

The requirement specifies the Recognized_possession_of_property_according_to_class for which a value
is required.

4.2.164.3   unit

If supplied, the unit specifies the Unit_of_measure in which the value required. If not specified, then the
value can be in any Unit_of_measure.

4.2.165   Required_output_description_according_to_class

A Required_output_description_according_to_class is an association between a Recognized_description_-
of_object_according_to_class (see 4.2.150) and a purpose that indicates:

– for a described object of the class that is associated by the Recognized_description_of_object_-
   according_to_class with the Class_of_information_content (see 4.2.27);

– as output from the Activity that is the purpose, or as output from an Activity of the class that is the
   purpose;

– a Description_of_object_by_information_content (see 4.2.79) association with an Information_content
   (see 4.2.98) of the class is required.

> NOTE 1 –   A Required_output_description_according_to_class is information about the user requirement. The
> association does not ensure that a description is recorded.
>
> An application program can check for required descriptions that are not recorded and for descriptions that are
> not required, but the operation of such a program is not specified by this part of ISO 10303.

EXAMPLE 236 – The association between:

- the Recognized_description_of_object_according_to_class that indicates an Information_content of the class heat_exchanger_process_data_sheet is a recognized description of a Facility of the class heat_-exchanger; and

- the Class_of_activity detailed_process_design,

that indicates a heat_exchanger_data_sheet is required for a heat_exchanger on output from a detailed_process_-design activity is a Required_output_description_according_to_class.

The data associated with a Required_output_description_according_to_class are the following:

- purpose;

- requirement.

4.2.165.1   purpose

The purpose specifies the Activity or Class_of_activity for which the description is required on output.

NOTE 1 – The different application objects that can be the purpose for which a description is required on output are presented in the ARM diagrams by the SELECT TYPE Purpose.

4.2.165.2   requirement

The requirement specifies the Recognized_description_of_object_according_to_class that is required.

4.2.166   Required_output_of_property_value_according_to_class

A Required_output_of_property_value_according_to_class is an association between a Recognized_possession_-of_property_according_to_class (see 4.2.154), a purpose and optionally a Unit_of_measure (see 4.2.179) that indicates:

- for an object of the class that is associated by the Recognized_possession_of_property_according_-to_class with the Class_of_property (see 4.2.31);

- as output from the Activity that is the purpose, or as output from an Activity of the class that is the purpose;

- a Possession_of_property_by_object (see 4.2.134) association with a Property of the class is required;

- that Property is required to possess a Numeric_value;

- if a Unit_of_measure is specified, then that Numeric_value is required to have the specified Unit_of_-measure.

NOTE 1 – A Required_output_of_property_value_according_to_class is information about the user requirement. The association does not ensure that a value is recorded.

An application program can check for required values that are not recorded and for values that are not required, but the operation of such a program is not specified by this part of ISO 10303.

EXAMPLE 237 – The association between:

- the Recognized_possession_of_property_according_to_class that indicates a Property of the class operating_pressure is a recognized Property of a Facility of the class heat_exchanger; and

- the Class_of_activity detailed_process_design,

that indicates an operating_pressure value is required for a heat_exchanger on output from a detailed_process_design activity is a Required_output_of_property_value_according_to_class.

The data associated with a Required_output_of_property_value_according_to_class are the following:

- purpose;

- requirement;

- units.

4.2.166.1 purpose

The purpose specifies the Activity or Class_of_activity for which the value is required on output.

NOTE 1 – The different application objects that can be the purpose for which a value is required on output are presented in the ARM diagrams by the SELECT TYPE Purpose.

4.2.166.2 requirement

The requirement specifies the Recognized_possession_of_property_according_to_class for which a value is required.

4.2.166.3 unit

If supplied, the unit specifies the Unit_of_measure in which the value required. If not specified, then the value can be in any Unit_of_measure.

4.2.167 Scaling_for_derivation

A Scaling_for_derivation is an association between a Derivation_of_annotation_element (see 4.2.75) and a 2d_scale (see 4.2.5) that indicates the mapping from the dimensions of the source Annotation_element to the dimensions of the derived Annotation_element is described by the 2d_scale.

The coordinate system of the source Annotation_element is the placement coordinate system (see 3.3) of the 2d_scale.

NOTE 1 – There is no coordinate shift between the source and the derived Annotation_elements. Hence a point in the source Annotation_element described by co-ordinates $(0,0)$ is mapped to the point in the derived Annotation_element with the same co-ordinates.

The data associated with a Scaling_for_derivation are the following:

– described;

– describing.

4.2.167.1 described

The described specifies the Derivation_of_annotation_element that is described by the 2d_scale.

4.2.167.2 describing

The describing specifies the 2d_scale that describes the Derivation_of_annotation_element.

4.2.168 Specific_object

A Specific_object is a type of Typical_or_specific_object (see 4.2.177) that has a unique existence, or is the intention for an object that could have a unique existence. A Specific_object is not a reference concept that embodies the shared aspect of a family of similar objects.

NOTES

1 – The term 'specific' is defined in 3.5.30.

2 – An reference concept or template from which a specific thing can be derived, is a Typical_object (see 4.2.178).

3 – A Material object that has been manufactured, or that is intended to be manufactured, is a Specific_object. It can be manufactured in accordance with a reference design which is a Typical_object.

4 – A Facility that has been implemented by actual specific Material objects, or that is intended to be implemented by actual specific Material objects, is a Specific_object. It can be implemented in accordance with a reference design which is a Typical_object.

4.2.169 Temporal_sequence_of_activity

A Temporal_sequence_of_activity is an association between two Activity objects (see 4.2.7) that indicates one Activity ends at a Point_in_time before the other begins.

NOTE 1 – The two Activity objects can, but need not, be parts of the same whole.

EXAMPLE 238 – The association between the Activity - specify the process conditions for heat exchanger E-4507, and the Activity - approve the process data for heat exchanger E-4507 for engineering, that indicates one comes after the other, is a Temporal_sequence_of_activity.

A Temporal_sequence_of_activity is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Temporal_sequence_of_activity shall associate two actual Activity objects. An intended Temporal_sequence_of_activity may associate either an actual or an intended predecessor Activity with an intended successor Activity.

NOTE 2 – An intended Temporal_sequence_of_activity that has an actual predecessor Activity and an intended successor Activity records an intent that the intended Activity shall follow the actual Activity.

An intended Temporal_sequence_of_activity that has an intended predecessor Activity and an intended successor Activity records an intent that one intended Activity shall follow the other.

The data associated with a Temporal_sequence_of_activity are the following:

– predecessor;

– successor.

4.2.169.1   predecessor

The predecessor specifies the Activity that ends before the successor Activity begins.

4.2.169.2   successor

The successor specifies the Activity that begins after the predecessor Activity ends.

4.2.170   Terminator_symbol

A Terminator_symbol is a type of Annotation_point (see 4.2.13) that is interpreted by a person as an indication of position and direction.

The specified Terminator_symbols are defined by this part of ISO 10303 within the AIM EXPRESS short listing (see 5.2).

NOTE – A Terminator_symbol is often associated with an Annotation_curve (see 4.2.11) by a Leader_terminator_for_annotation_curve (see 4.2.104).

4.2.171   Text

A Text string is a type of Information_content (see 4.2.98) that is a sequence of one or more characters.

EXAMPLES

239 – "V1a" is an instance of Text.

240 – "`\begin{document} ....... \end{document}`" is an instance of Text.

This Text string is the LaTeX source for the Much Binding B power station safety case. It is a definition of the document with reference "MBB/SCR/12345", that is a Typical_object (see 4.2.178) and a Physical_information_carrier (see 4.2.124).

This Text string is held by file mbb_scr_12345.tex, that is a Facility and Logical_information_carrier (see 4.2.108).

The data associated with a Text string are the following:

– content.

The content is the sequence of characters that is the Text.

4.2.172   Text_appearance

A Text_appearance is a type of Information_content (see 4.2.98) that describes the shape of each character in an Annotation_text.

> NOTES
>
> 1 – A Text_appearance does not describe the colour of an Annotation_text. A colour is associated by a Possession_of_property_by_object (see 4.2.134).
>
> 2 – A Text_appearance does not describe a scaling of an Annotation_text with respect to a Text_font (see annex M, instance 14). This information is associated by a Scaling_for_derivation (see 4.2.167).

The data associated with a Text_appearance are the following:

– aspect_ratio;

– rotation_angle;

– slant_angle.

4.2.172.1   aspect_ratio

The character_ratio specifies the Numeric_value (see 4.2.112) that describes the width to height ratio for each character in the Annotation_text. The ratio is measured for the character before shearing.

4.2.172.2   rotation_angle

The rotation_angle specifies the Numeric_value that describes the angle of rotation of each character in the Annotation_text with respect to the coordinate system of the Annotation_text.

Each character is rotated from its normal orientation, in which the up direction for the character is in the direction of the y coordinate axis for the Annotation_text, by the angle in an anti-clockwise direction.

4.2.172.3   slant_angle

The slant_angle specifies the Numeric_value that describes the angle of shear in the shape of each character in the Annotation_text.

The angle of shear defines a transformation of a character from its normal appearance such that:

– a line drawn on the character that is horizontal when the character is viewed in its normal orientation remains horizontal after transformation;

– a line drawn on the character that is vertical when the character is viewed in its normal orientation is rotated clockwise by the angle of shear.

4.2.173   Text_box_for_annotation_text

A Text_box_for_annotation_text is an association between an Annotation_text (see 4.2.14) and a 2d_-box_dimensions (see 4.2.1) that indicates the Annotation_text is fitted within a box described by the 2d_box_dimensions.

The coordinate system of the Annotation_text is the placement coordinate system (see 3.3) of the 2d_-box_dimensions. The box is placed such that its centre is at the origin of the coordinate axes for the Annotation_text.

> NOTE 1 –   An Annotation_text can be associated by a Derivation_of_annotation_element (see 4.2.75) with an Annotation_element that is a Text_font (see annex M, instance 14). The Annotation_text derived from this font need not fit into the specified box.

> Such inconsistent data is not excluded by this part of ISO 10303. The operation of an application program that receives such data is not defined by this part of ISO 10303.

The data associated with a Text_box_for_annotation_text are the following:

– described;

– describing.

4.2.173.1   described

The described specifies the Annotation_text that fits into the box.

4.2.173.2   describing

The describing specifies the 2d_box_dimensions that describe the box within which the Annotation_text fits.

4.2.174   Tiling_derivation_for_annotation_element

A Tiling_derivation_for_annotation_element is a type of Derivation_of_annotation_element (see 4.2.75) that indicates the derived Annotation_element (see 4.2.12) is a tiling pattern created by replicating the source Annotation_element.

A tiling pattern is a regularly spaced two dimensional array of identical Annotation_elements. The array need not be rectangular.

The tiling pattern is clipped at the boundary of the derived Annotation_element. A Tiling_derivation_-for_annotation_element does not indicate the shape of the derived Annotation_element.

The shape of the derived Annotation_element is specified exactly as if it were a uniform area of colour.

A Scaling_for_derivation (see 4.2.167) associated with Tiling_derivation_for_annotation_element deter-mines the size of the replicas of the source Annotation_element in the tiling pattern.

> NOTES

1 – A description of the spacing and orientation for the replicas of a source Annotation_element is a Tiling_pattern (see 4.2.175). A Tiling_pattern is associated with a Tiling_derivation_for_annotation_element by a Description_of_tiling_by_pattern (see 4.2.83).

2 – The source Annotation_element is often classed as a Tiling_template (see annex M, instance 15).

4.2.175   Tiling_pattern

A Tiling_pattern is a type of Information_content (see 4.2.98) that is a description of a regularly spaced two dimensional array of tile Annotation_elements.

NOTES

1 – The array is not necessarily rectangular.

2 – A Tiling_pattern can be associated with a Tiling_derivation_for_annotation_element (see 4.2.174) by a Description_of_tiling_by_pattern (see 4.2.83) to describe the pattern of Annotation_elements created by the derivation.

EXAMPLE 241 – The shaded areas in figure 20 are a single rectangular Annotation_area with a tiling pattern. The Annotation_area is larger than normal size, and the magnitudes of the repeat vectors are larger than normal compared to the size of the Annotation_area.

The outer boundary of the Annotation_area is shown as a dashed line. The coordinate axes of the Annotation_area are denoted x and y.

The coordinate axes for a typical tile are denoted x' and y'.

The rotation that specifies the orientation of the tiles, and the repeat vectors that specify the spacing of the tiles are shown in the figure.

The data associated with a Tiling_pattern are the following:

– orientation;

– repeat_1;

– repeat_2.

4.2.175.1   orientation

The orientation specifies the Numeric_value (see 4.2.112) that describes the angle of rotation of the tile in an anti-clockwise sense from its initial position. In its initial position a tile is a replica of the source Annotation_element such that the coordinate system of the source Annotation_element is aligned with the coordinate system of the derived Annotation_element.

4.2.175.2   repeat_1

The repeat_1 specifies the 2d_vector (see 4.2.6) that describes direction 1 of the tiling pattern and the distance between tiles in that direction.
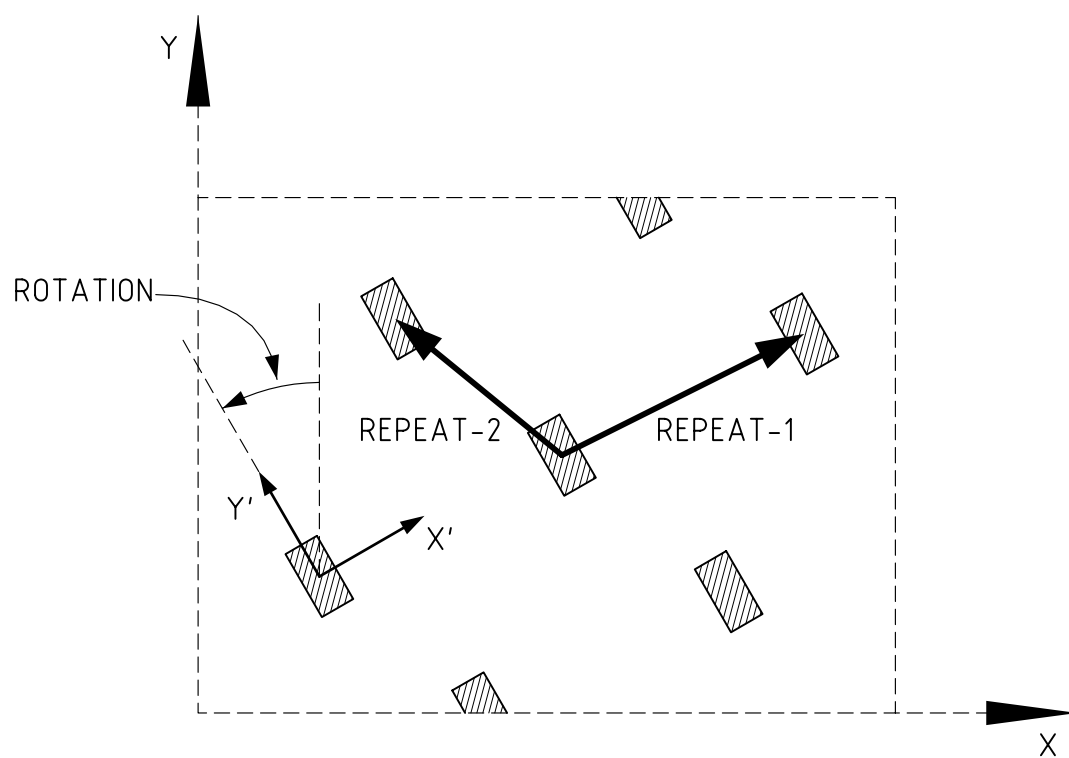
Figure 20 – An Annotation_area with tiling pattern

4.2.175.3   repeat_2

The repeat_2 specifies the 2d_vector (see 4.2.6) that describes direction 2 of the tiling pattern and the distance between tiles in that direction.

4.2.176   Topologic_sequence_of_facility

A Topologic_sequence_of_facility is an association between three Facility objects (see 4.2.89) (predecessor, successor and context) that indicates the successor comes after the predecessor along a path defined by the context.

The set of Topologic_sequence_of_facility associations for the same context defines a single topologic order.

>   NOTES

>   1 – This association is used to give a topologic sequence to connectors, in-line instruments, and in-line components within a Piping_segment (see annex M, instance 266).

>   2 – A Topologic_sequence_of_facility does not specify non-topologic information such as flow direction.

>   EXAMPLE 242 – Piping_segment S12 shown in figure 21 has a branch, a flow transducer and another branch in sequence.

>   The following topologic sequence information is recorded:

>   – Connector_of_facility T1 follows Connector_of_facility end 1;

>   – flow transducer 45 FT 501 (a Facility) follows T1; and

>   – Connector_of_facility T2 follows flow transducer 45 FT 501.

>   Each item of information in this list is a Topologic_sequence_of_facility.

A Topologic_sequence_of_facility is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Topologic_sequence_of_facility shall have actual Facility objects that are the predecessor, successor and context.

An intended Topologic_sequence_of_facility may have either actual or intended Facility objects that are the predecessor, successor and context.

>   NOTE 3 – An intended Topologic_sequence_of_facility records the intent that two Facility objects shall be connected to have the specified sequence. It does not matter whether or not the two Facility objects are intended or actual.

>   The context for the sequence can be either an actual or an intended Facility. The intent is recorded that the predecessor and successor Facility objects shall have the specified sequence as components of the context Facility. An actual predecessor or successor can be an actual component of an actual context Facility. An actual or an intended predecessor or successor can be an intended component of an actual or an intended context Facility.

The data associated with a Topologic_sequence_of_facility are the following:
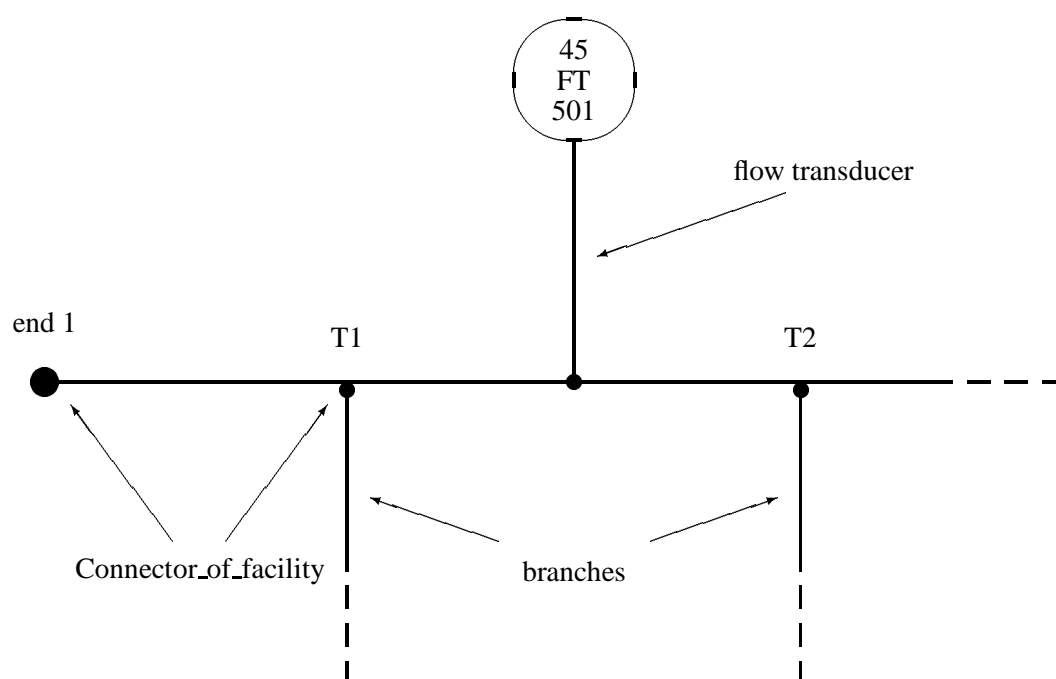
Figure 21 – Topologic sequence within a Piping_segment

– context;

– predecessor;

– successor.

4.2.176.1   context

The context specifies the Facility that provides the context for the topologic sequencing.

The direction of sequencing is arbitrary, but is consistent for a context.

4.2.176.2   predecessor

The predecessor specifies the Facility that comes before the successor Facility in the topologic sequence specified by the context.

4.2.176.3   successor

The successor specifies the Facility that comes after the predecessor Facility in the topologic sequence specified by the context.

4.2.177   Typical_or_specific_object

A Typical_or_specific_object is something that exists in the real world or in the minds of people that may be recorded as an application object by this part of ISO 10303, and that may be either typical (see 3.5.31) or specific (see 3.5.30).

Each Typical_or_specific_object is one of:

– Activity;

– Facility;

– Material.

  NOTE 1 – These are the application objects in this part of ISO 10303 that can be typical or specific.

All application objects that are not Typical_or_specific_objects, are always specific within the scope of this part of ISO 10303.

Each Typical_or_specific_object is also one of:

– Typical_object (see 4.2.178);

– Specific_object (see 4.2.168).

  NOTES

2 – All classes are specific. In the real world, classification authorities can have template for classes, but the recording of such templates is not within the scope of this part of ISO 10303.

3 – All Information_contents are specific. The use of typical Text objects or typical Numeric_values as parameters is not within the scope of this part of ISO 10303.

4.2.178   Typical_object

An Typical_object is a type of Typical_or_specific_object (see 4.2.177) that is a reference concept embodying the shared aspect of a family of similar objects.

NOTES

1 – The term 'typical' is defined in 3.5.31.

2 – A Typical_object is a reference concept or temeplate, whereas a Specific_object (see 4.2.168) is something that has a unique existence, or an intention for something that can have a unique existence.

3 – A Specific_object that has been derived from a Typical_object can be associated with the Typical_object by a Derivative_association_between_objects (see 4.2.76).

4.2.179   Unit_of_measure

A Unit_of_measure is a standard instance of Property.

NOTES

1 – A Property is described by being compared to a standard Property or Unit_of_measure. The ratio between the described Property and the standard property is recorded as a Numeric_value.

2 – The SI instances of Unit_of_measure are defined in ISO 1000.

4.2.180   Usage_of_facility_in_connection

A Usage_of_facility_in_connection is an association between a Facility (see 4.2.89) and a Connection_of_facility (see 4.2.65) that indicates the Facility is used to make the connection.

NOTE 1 –   A Facility that is used to make a connection is connected in some way to the Material objects that it connects. A Usage_of_facility_in_connection records that a Facility is, or is intended to be, used to make a connection but does not record how it is connected in order to do so.

EXAMPLE 243 –   The association between:

– the connection association between pump P-4506-A and the heat exchanger E-4507 in annex L; and

– the control valve 45-FCV-501,

that indicates the control valve is used in the connection, is a Usage_of_facility_in_connection.

A Usage_of_facility_in_connection is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Usage_of_facility_in_connection shall associate an actual Facility with an actual Connection_of_facility. An intended Usage_of_facility_in_connection may associate either an actual or an intended Facility with either an actual or an intended connection.

> NOTE 2 – The intent for a connection can be recorded between:
>
> – a Facility that exists and a connection that exists;
>
> In this case, an intent to change an existing connection so that it uses a different existing Facility is recorded.
>
> – a Facility that exists and an intended connection;
>
> In this case, an intent to create a connection using an existing Facility is recorded.
>
> – an intended Facility and a connection that exists;
>
> In this case, an intent to change an existing connection so that it uses an intended Facility is recorded.
>
> – an intended Facility and an intended connection.
>
> In this case, an intent to create a connection using an intended Facility is recorded.

The data associated with a Usage_of_facility_in_connection are the following:

– used;

– using.

4.2.180.1   used

The used specifies the Facility that is used to make the connection.

4.2.180.2   using

The using specifies the Connection_of_facility that is made by the used Facility.

4.2.181   Usage_of_feature_in_connection_of_material

A Usage_of_feature_in_connection_of_material is an association between a Feature (see 4.2.90) and a Connection_of_material (see 4.2.66) that indicates the Feature is used to make the connection.

> EXAMPLE 244 – The association between:
>
> – face of the flange to the inlet nozzle of vessel V-4506 in annex L (a Feature); and
>
> – and the connection between the flange of the inlet nozzle and the flange at the end of Piping_segment S12 (a Connection_of_material),

that indicates the face is used in the connection, is a Usage_of_feature_in_connection_of_material.

A Usage_of_feature_in_connection_of_material is either an Intended_object (see 4.2.101 or an Actual_-object (see 4.2.8).

An actual Usage_of_feature_in_connection_of_material shall associate an actual Feature with an actual Connection_of_material. An intended Usage_of_feature_in_connection_of_material may associate either an actual or an intended Feature with either an actual or an intended connection.

NOTE 1 – The intent for a connection can be recorded between:

– a Feature that exists and a connection that exists;

In this case, an intent to change an existing connection so that it uses a different existing Feature is recorded.

– a Feature that exists and an intended connection;

In this case, an intent to create a connection using an existing Feature is recorded.

– an intended Feature and a connection that exists;

In this case, an intent to change an existing connection so that it uses an intended Feature is recorded.

– an intended Feature and an intended connection.

In this case, an intent to create a connection using an intended Feature is recorded.

The data associated with a Usage_of_feature_in_connection_of_material are the following:

– used;

– using.

4.2.181.1   used

The used specifies the Feature that is used to make the connection.

4.2.181.2   using

The using specifies the Connection_of_material that is made by the used Feature.

4.2.182   Usage_of_material_in_connection

A Usage_of_material_in_connection is an association between a Material (see 4.2.110) and a Connection_-of_material (see 4.2.66) that indicates the Material object is used to make the connection.

NOTE 1 – A Material object that is used to make a connection is connected in some way to the Material objects that it connects. A Usage_of_material_in_connection records that a Material is, or is intended to be, used to make a connection but does not record how it is connected in order to do so.
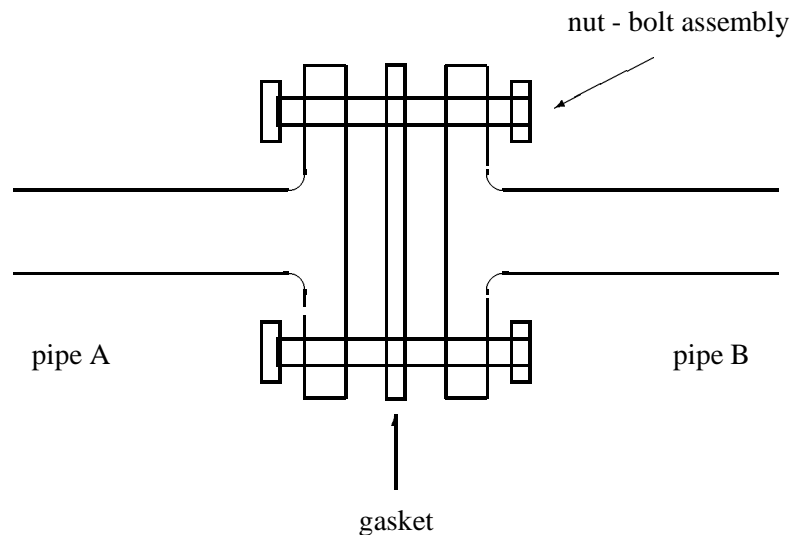
Figure 22 – Material object used in a bolted connection

EXAMPLE 245 – Nuts, bolts and a gasket are used in the bolted connection shown in figure 22.

The following statements can be made about this connection:

– pipe A is connected to pipe B;

This is a Connection_of_material (see 4.2.66).

– the following Material objects are used in the connection:

• a gasket;

• 6 bolts;

• 6 nuts.

The association between each item and the connection is a Usage_of_material_in_connection.

NOTE 2 – A collection of identical items is single Material object. The number of items is a Property of class Number_of_items (see annex M, instance 1279) of the collected object.

A Usage_of_material_in_connection is either an Intended_object (see 4.2.101 or an Actual_object (see 4.2.8).

An actual Usage_of_material_in_connection shall associate an actual Material object with an actual Connection_of_material. An intended Usage_of_material_in_connection may associate either an actual or an intended Material object with either an actual or an intended connection.

NOTE 3 – The intent for a connection can be recorded between:

  – a Material object that exists and a connection that exists;

    In this case, an intent to change an existing connection so that it uses a different existing Material object is recorded.

  – a Material object that exists and an intended connection;

    In this case, an intent to create a connection using an existing Material object is recorded.

  – an intended Material object and a connection that exists;

    In this case, an intent to change an existing connection so that it uses an intended Material object is recorded.

  – an intended Material object and an intended connection.

    In this case, an intent to create a connection using an intended Material object is recorded.

The data associated with a Usage_of_material_in_connection are the following:

 – used;

 – using.

4.2.182.1   used

The used specifies the Material object that is used to make the connection.

4.2.182.2   using

The using specifies the Connection_of_material that is made by the used Material object.

4.2.183   Valid_context_for_hierarchy_of_composition_of_facility

A Valid_context_for_hierarchy_of_composition_of_facility is an association between a context object and a Hierarchy_of_composition_of_facility (see 4.2.92) that indicates the context object is a purpose or domain of validity of the Hierarchy_of_composition_of_facility.

The meaning a Valid_context_for_hierarchy_of_composition_of_facility depends upon the context object as shown in table 4.

EXAMPLE 246 – The association between:

  – the set of composition associations that assembles each Facility into one and only one assembly for the purpose of identification (a Hierarchy_of_composition_of_facility), and

  – the Class_of_activity 'facility identification',

Table 4 – Meaning of Valid_context_for_hierarchy_of_facility

context object	meaning of association
Activity	The hierarchy is used for the Activity.
Class_of_activity	The hierarchy is used for an Activity of the class.
Organization	The hierarchy is used for an Activity carried out by the Organization.

that indicates a purpose of the set of composition associations is 'facility identification', is a Valid_context_for_hierarchy_of_composition_of_facility.

The data associated with a Valid_context_for_hierarchy_of_composition_of_facility are the following:

– hierarchy;

– context.

4.2.183.1   hierarchy

The hierarchy specifies the Hierarchy_of_composition_of_facility for which a purpose or domain of validity is assigned.

4.2.183.2   context

The context specifies the object that is the purpose or domain of validity of the hierarchy.

The application objects that may be the context for a Hierarchy_of_composition_of_facility are as follows:

– Activity;

– Class_of_activity;

– Organization.

NOTE 1 – The different application objects that can be a context are presented in the ARM diagrams by the SELECT TYPE Hierarchy_context_object.

Table 5 – Meaning of Valid_context_for_hierarchy_of_material

context object	meaning of association
Activity	The hierarchy is used for the Activity.
Class_of_activity	The hierarchy is used for an Activity of the class.
Organization	The hierarchy is used for an Activity carried out by the Organization.

4.2.184   Valid_context_for_hierarchy_of_composition_of_material

A Valid_context_for_hierarchy_of_composition_of_material is an association between a context object and a Hierarchy_of_composition_of_material (see 4.2.93) that indicates the context object is the purpose or domain of validity of the Hierarchy_of_composition_of_material.

The meaning a Valid_context_for_hierarchy_of_composition_of_material depends upon the context object as shown in table 5.

EXAMPLE 247 –   The association between:

– the set of composition associations that assigns each weld Material in Much Binding B either to the item on one side or the item on the other (a Hierarchy_of_composition_of_material); and

– the Class_of_activity weld_inspection,

that indicates a purpose of the set of composition associations is weld_inspection, is a Valid_context_for_-hierarchy_of_composition_of_material.

The data associated with a Valid_context_for_hierarchy_of_composition_of_material are the following:

– hierarchy;

– context.

4.2.184.1   hierarchy

The hierarchy specifies the Hierarchy_of_composition_of_material for which a purpose or domain of validity is assigned.

4.2.184.2   context

The context specifies the object that is the purpose or domain of validity of the hierarchy.

Table 6 – Meaning of Valid_context_for_identification

context object	meaning of association
Activity	The identification is used for the Activity.
Class_of_activity	The identification is used for an Activity of the class.
Facility	The identification is used for a Facility when it is regarded as a part of, or as a connector of, the context object.
Material	The identification is used for a Material object or Feature when it is regarded as a part of, or as begin possessed by, the context object.
Organization	The identification is used for an Activity carried out by the Organization.

The application objects that may be the context for a Hierarchy_of_composition_of_material are as follows:

– Activity;

– Class_of_activity;

– Organization.

NOTE 1 – The different application objects that can be a context are presented in the ARM diagrams by the SELECT TYPE Hierarchy_context_object.

4.2.185 Valid_context_for_identification

A Valid_context_for_identification is an association between an Identification_of_object_by_information_-content (see 4.2.96) and a context object that indicates the identification is valid for the purpose or within the domain indicated by the context object.

The purpose or domain for which an identification is valid depends upon the the context object as shown in table 6.

NOTES

1 – An instrument can be part of two control loops, and can have a different identification in each. In this case the Facility that is the control loop is the context for the identification.

2 – A connector of a Facility that is an assembly is also a connector of a part of that assembly as shown in figure 17.

The connector can have different identifications in its roles as a connector of the part and as a connector of the whole. In this case, the Facility that is the part or the whole is the context for the identification.

3 – A Material object can be given different identifications by the fabricator and by the owner operator. In this case the Organization is the context for the identification.

EXAMPLES

248 – The association between:

– the association between the Material object fabricated by J. Bloggs and Co. and the Text "JBC/96/12345" by which it its known at J. Bloggs and Co. (an Identification_of_object_by_information_content); and

– the Organization J. Bloggs and Co.,

that indicates the "JBC/96/12345" is an identification used by J. Bloggs and Co., is a Valid_context_for_identification.

249 – The association between:

– association between the Connector_of_facility designated 2bB and 2B in Figure 17 and the Text "2bB" (an Identification_of_object_by_information_content); and

– the Facility bB,

that indicates "2bB" is an identification valid for the Connector_of_facility in its role as a connector of Facility bB, is a Valid_context_for_identification.

The identification "2B" for the same Connector_of_facility is valid in its role as a connector of Facility B.

The data associated with a Valid_context_for_identification are the following:

– context;

– identification.

4.2.185.1   context

The context specifies the application object that is the purpose or domain of validity of the identification.

The application objects that may be a context for identification are as follows:

– Activity;

– Class_of_activity;

– Facility;

– Material;

– Organization.

> NOTE 1 – The different application objects that can be a context for identification are presented in the ARM diagrams by the SELECT TYPE Identification_context_object.

4.2.185.2   identification

The identification specifies the Identification_of_object_by_information_content that is valid for the purpose or within the domain.

4.2.186   Version_association_between_objects

A Version_association_between_objects is an association between one -object and another that indicates one is a version of the other.

One object is a version of another if it replaces, or is intended to replace the other, where the reason for replacement is either:

– the intended or actual successor object is an improvement upon its predecessor; or

– the intended successor object is more completely defined that its predecessor.

> NOTE 1 – Usually, if two objects have a Version_association_between_objects between them, then there are many other application objects that are associated with both of them.

> Two intended Facility objects with a Version_association_between_objects between them would usually have components in common. These would be components that were not effected by the changes leading to the new version.

> EXAMPLES

> 250 – There can be a predecessor and a successor variant of the intended Facility that is pump P-4506-A in annex L. Both have a Connection_of_facility association with the Piping_segment S1a.

> 251 – There can be a predecessor and a successor variant of the intended Facility that is the distillate transfer system in annex L. Both have an Assembly_of_facility association with the pump P-4506-A.

> 252 – The association between Much Binding B power station when it was oil fired, and Much Binding B power station after conversion to coal firing, is a Version_association_between_objects.

> In this case both objects are actual.

The data associated with a Version_association_between_objects are the following:

– predecessor;

– successor.

4.2.186.1   predecessor

The predecessor specifies the object that is to be replaced by the successor.

Each application object may be the predecessor for a Version_association_between_objects.

> NOTE 1 – The application objects that can be the predecessor are presented in the ARM diagrams by the SELECT TYPE Controlled_object.

4.2.186.2   successor

The successor specifies the object that replaces the predecessor.

Each application object may be the successor for a Version_association_between_objects.

> NOTE 1 – The application objects that can be the successor are presented in the ARM diagrams by the SELECT TYPE Controlled_object.

4.2.187   View_derivation_for_annotation_element

A View_derivation_for_annotation_element is a type of Derivation_of_annotation_element (see 4.2.75) that may exclude part of the source Annotation_element (see 4.2.12) from the derivation.

The derived Annotation_element does not contain areas of colour, shading or texture corresponding to the parts of the source Annotation_element that are excluded.

> NOTES
>
> 1 – A part of the source Annotation_element can be excluded by:
>
> – clipping the source Annotation_element geometrically using a clipping box (see 4.2.45); or
>
> – explicitly specifying an Annotation_element that is part of the source to be invisible by an
>
> Invisible_annotation_element_in_view (see 4.2.102).
>
> 2 – The derived Annotation_element is often classed as a Layer (see annex M, instance 8).

4.2.188   Width_for_annotation_curve

A Width_for_annotation_curve is an association between and Annotation_curve (see 4.2.11) and a length Numeric_value that indicates the length describes the width of the Annotation_curve.

An Annotation_curve is one or more areas of colour, shading or texture that have a common centre line. The width describes the dimension of the area of colour perpendicular to the centre line.

> EXAMPLE 253 – The shaded area in figure 7 is an Annotation_curve that is larger than normal. The width of the Annotation_curve that is specified by the Numeric_value is indicated.

The data associated with a Width_for_annotation_curve are the following:

– described;